MARCH AFB
CALIFORNIA

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 2196

Contract No.: FA8903-01-D-8671
Delivery Order No.: 0003
Modification No. 01

IRP SITE 2
THIRD QUARTER PROCESS MONITORING REPORT
JULY 1 TO SEPTEMBER 30, 2004
MARCH AIR RESERVE BASE, CALIFORNIA

Prepared for:
Air Force Reserve Command
452nd Civil Engineering Squadron/CEV
Environmental Management
610 Meyer Dr., Bldg. 2403
March ARB, California 92518-2166

and

Air Force Center for Environmental Excellence
3300 Sidney Brooks
Brooks City-Base, Texas 78235-5112

Prepared by:

Earth Tech, Inc.
1461 E. Cooley Drive, Suite 100
Colton, California 92324

MAY 2005

Earth Tech
A Tyco International Ltd. Company

Rec'd
6/1/05

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ACRONYMS

AFCEE	Air Force Center for Environmental Excellence
ARB	Air Reserve Base
AST	aboveground storage tank
B	method blank contamination
BTEX	benzene, toluene, ethylbenzene, and total xylenes
°	degree
DO	delivery order
F	Fahrenheit
FID	flame ionization detector
GAC	granular-activated carbon
gpm	gallon per minute
GWTS	groundwater treatment system
Hg	mercury
IRP	Installation Restoration Program
J	estimated value
µg/L	micrograms per liter
MWH	Montgomery Watson Harza
NA	not applicable
ND	not detected
O&M	operation and maintenance
ppmv	parts per million by volume
R	rejected result
SCAQMD	South Coast Air Quality Management District
scf	standard cubic feet
scfm	standard cubic feet per minute
SVE	soil vapor extraction
SVMP	soil vapor monitoring point
TCE	trichloroethylene
TPH	total petroleum hydrocarbons
TVPH	total volatile petroleum hydrocarbons
UST	underground storage tank
V	elevated reporting limit
VOC	volatile organic compound

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1.0 INTRODUCTION

1.1 BACKGROUND

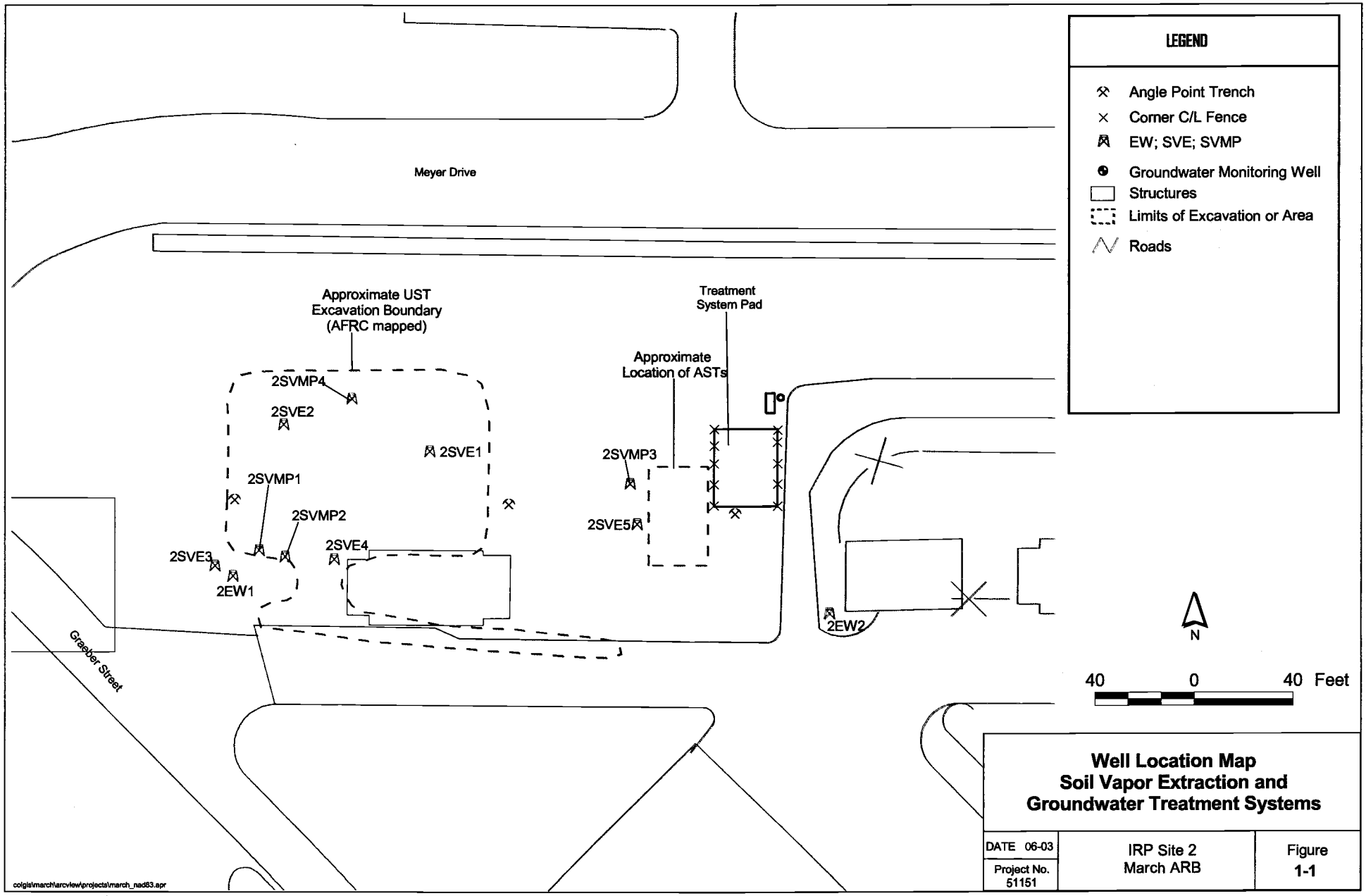
The Air Force Center for Environmental Excellence (AFCEE) has contracted with Earth Tech, Inc., to install a soil vapor extraction (SVE) system and a groundwater treatment system (GWTS) to remediate contaminated soil and groundwater at Installation Restoration Program (IRP) Site 2 on March Air Reserve Base (ARB), California. The well location map for the SVE and GWTS system is shown in Figure 1-1. The systems were installed per design documents prepared by Montgomery Watson Harza (MWH) with minor modifications to the well field layout and well designs (MWH, 2001a, 2001b). Installation and operation of the systems are being conducted per the approved work plan and Treatability Implementation Plan prepared by Earth Tech (Earth Tech, 2002a, 2002b). This report contains system description, operational data, and analysis between July 2004 and September 2004, and recommendations for future operations. This report is being prepared for AFCEE under Contract No. FA8903-01-D-8671, Delivery Order (DO) 3, Modification 01. Background for construction and installation of both systems and operational data collected between March 2002 and March 2004 were presented in *IRP Sites 2 & 27 Treatability Implementation Plan* (Earth Tech, 2002b), *IRP Site 2 System Evaluation Report* (Earth Tech, 2002c), and *IRP Site 2 Quarterly Process Monitoring Report* (Earth Tech, 2003a, 2003b, 2003c, 2003d, 2004a, 2004b).

1.2 REPORT CONTENTS

This report summarizes the activities related to the SVE system and GWTS that were installed at IRP Site 2 at March ARB, California, for the time period July 1 to September 30, 2004. The report is presented in five sections: introduction, system description, operation and maintenance (O&M) activities, summary of results and recommendations, and references. Two appendices are included, one that provides analytical results for all samples collected at the site during this reporting period, and one with data validation reports.

1.3 OPERATIONAL HISTORY

The initial objectives of this remedial action were to install an SVE system and a GWTS to remediate contaminated soil and groundwater at IRP Site 2. Previously, MWH installed three SVE wells (2SVE3, 2SVE4, and 2SVE5), three soil vapor monitoring points (SVMPs) (2SVMP1, 2SVMP2, and 2SVMP3), and one groundwater extraction well (2EW1) around the site during the pre-design phase (MWH, 1999). During the first half of 2002, Earth Tech installed two additional SVE wells (2SVE1 and 2SVE2), one additional SVMP well (2SVMP4), and one additional groundwater extraction well (2EW2) at IRP Site 2. In addition, a government-owned trailer-mounted 500 standard cubic foot per minute (scfm) thermal oxidizer unit was installed on an equipment pad along with piping and electrical wiring to connect the system to the well field. The GWTS, using granular-activated carbon (GAC) as a treating media, was installed at the


LEGEND
Angle Point Trench
Corner C/L Fence
EW; SVE; SVMP
Groundwater Monitoring Well
Structures
Limits of Excavation or Area
Roads
Meyer Drive
Approximate UST Excavation Boundary (AFRC mapped)
Treatment System Pad
Approximate Location of ASTs
2SVMP4
2SVE2
2SVE1
2SVMP3
2SVMP1
2SVMP2
2SVE5
2SVE4
2SVE3
2EW1
2EW2
Graeber Street
N
40 0 40 Feet
Well Location Map
Soil Vapor Extraction and
Groundwater Treatment Systems
DATE 06-03
Project No. 51151
IRP Site 2
March ARB
Figure
1-1
colgis\march\arcview\projects\march_nad83.apr

equipment pad with associated piping and electrical wiring to the two groundwater extraction wells (2EW1 and 2EW2). Piping from the GAC canisters was routed to the base sewage treatment system. System startup of both the SVE system and GWTS commenced on June 5, 2002. Full-scale operation began on June 10, 2002 (Earth Tech, 2002b).

A noticeable rise in the groundwater levels in the area and rise in the water columns when vacuum is applied was noted in the SVE extraction wells. Pneumatic pumps were installed in 2SVE1 and 2SVE2 to dewater the submerged screened intervals and increase vapor flow rates in late 2003. The hoses for the pumps were installed inside the existing SVE pipeline and routed to the treatment compound. Minor modifications to the existing GWTS were made, including a 300-gallon equalization tank, transfer pump, and tank level controls. Groundwater from the four extraction pumps (2EW1, 2EW2, 2SVE1, and 2SVE2) enters the equalization tank before being transferred via pump to the existing filtration and GWTS GAC system. Full-scale operation of the pneumatic pumps installed in 2SVE1 and 2SVE2 began on December 2, 2003.

On June 16, 2004, per the decision matrix in the Treatability Implementation Plan (Earth Tech, 2002b), the existing thermal oxidizer SVE unit was shutdown, disconnected, and moved to IRP Site 27 because the combined influent soil vapor levels at Site 2 dropped below 500 parts per million by volume (ppmv). The lower soil vapor levels make treatment using vapor phase GAC a more cost-effective method of treatment. Installation of a replacement SVE treatment system that included a 250-scfm blower package, associated equipment, and three 2,000-pound vapor phase GAC vessels began on June 24, 2004. Full-scale operation of the new SVE treatment system began on July 6, 2004, and remained operational for the balance of the 3rd quarter.

As of September 30, 2004, the new GAC SVE treatment system at Site 2 had logged 2,010 hours of run time and had removed an estimated 309 pounds of contaminants. The cumulative total run time of both the new and old SVE treatment system as of September 30, 2004, is 17,579 hours with a collective removal of 45,842 pounds of contaminants, including approximately 42,865 pounds of total volatile petroleum hydrocarbons (TVPH) and approximately 2,975 pounds of benzene, toluene, ethylbenzene, and total xylenes (BTEX). As of September 30, 2004, the GWTS at Site 2 has treated 1,187,950 gallons of groundwater and removed an estimated 113.3 pounds of contaminants, including approximately 21.8 pounds of BTEX, 91.4 pounds of total petroleum hydrocarbons (TPH), and approximately 0.15 pound of trichloroethylene (TCE).

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2.0 SYSTEM DESCRIPTION

This section summarizes the system description along with process diagrams for the SVE system and GWTS at IRP Site 2. Detailed manufacturer's cut-sheets and component specifications can be found in the IRP Sites 2 and 27 Treatability Implementation Plan (Earth Tech, 2002b) and in Appendix C.

2.1 SVE SYSTEM

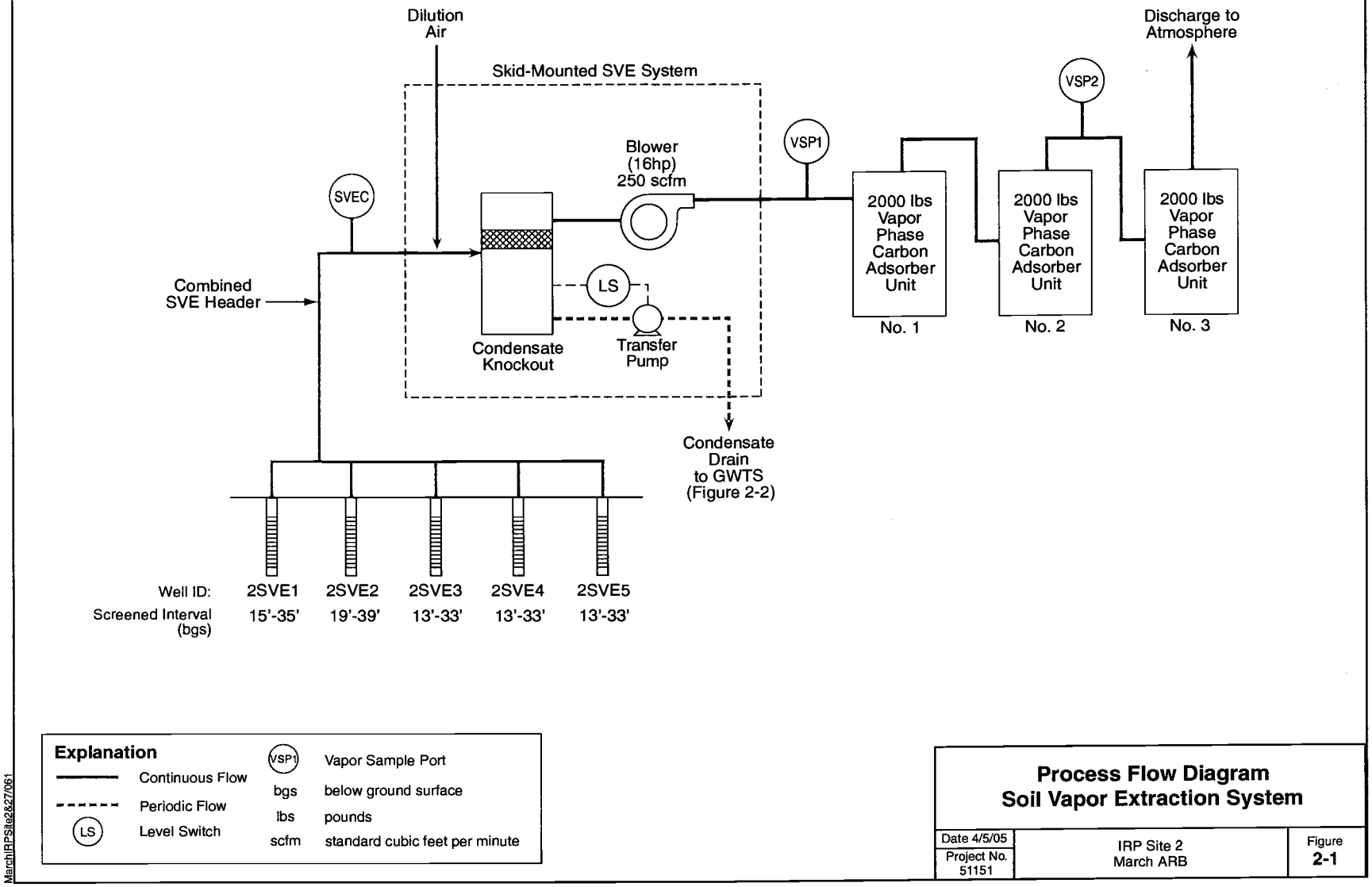
On June 16, 2004, the thermal oxidizer SVE unit was shutdown, disconnected, and moved to IRP Site 27 because the combined influent soil vapor levels at Site 2 had dropped below 500 ppmv. At the lower soil vapor contaminant concentration levels, the increased fuel gas consumption of the thermal oxidizer makes the GAC treatment system a more economical treatment method. Per the Treatability Implementation Plan (Earth Tech, 2002b), the treatment method chosen was GAC. Installation of the new Site 2 250-scfm blower package, associated equipment, and three 2,000-pound vapor phase GAC vessels began on June 24, 2004. Full-scale operation of the new system began on July 6, 2004. The new Site 2 GAC treatment system was fully operational for the balance of the 3rd Quarter.

The SVE treatment system includes a skid-mounted, self-contained, electrically driven blower package rated for a flow rate of up to 250 scfm and a vacuum of 8 inches of mercury (Hg). The exhaust of the blower feeds into an air cooler and then enters the first of three identical vapor phase GAC adsorber units, each containing 2,000 pounds of GAC. The three GAC units are connected together in series with flexible hoses, each unit receiving the exhaust vapor from the previous unit. The SVE GAC unit treated vapors from three SVE wells (2SVE1, 2SVE2, and 2SVE5) between July 1, 2004, and September 30, 2004. SVE wells 2SVE3 and 2SVE4 remained closed throughout the quarter. A schematic diagram for the SVE system is shown in Figure 2-1.

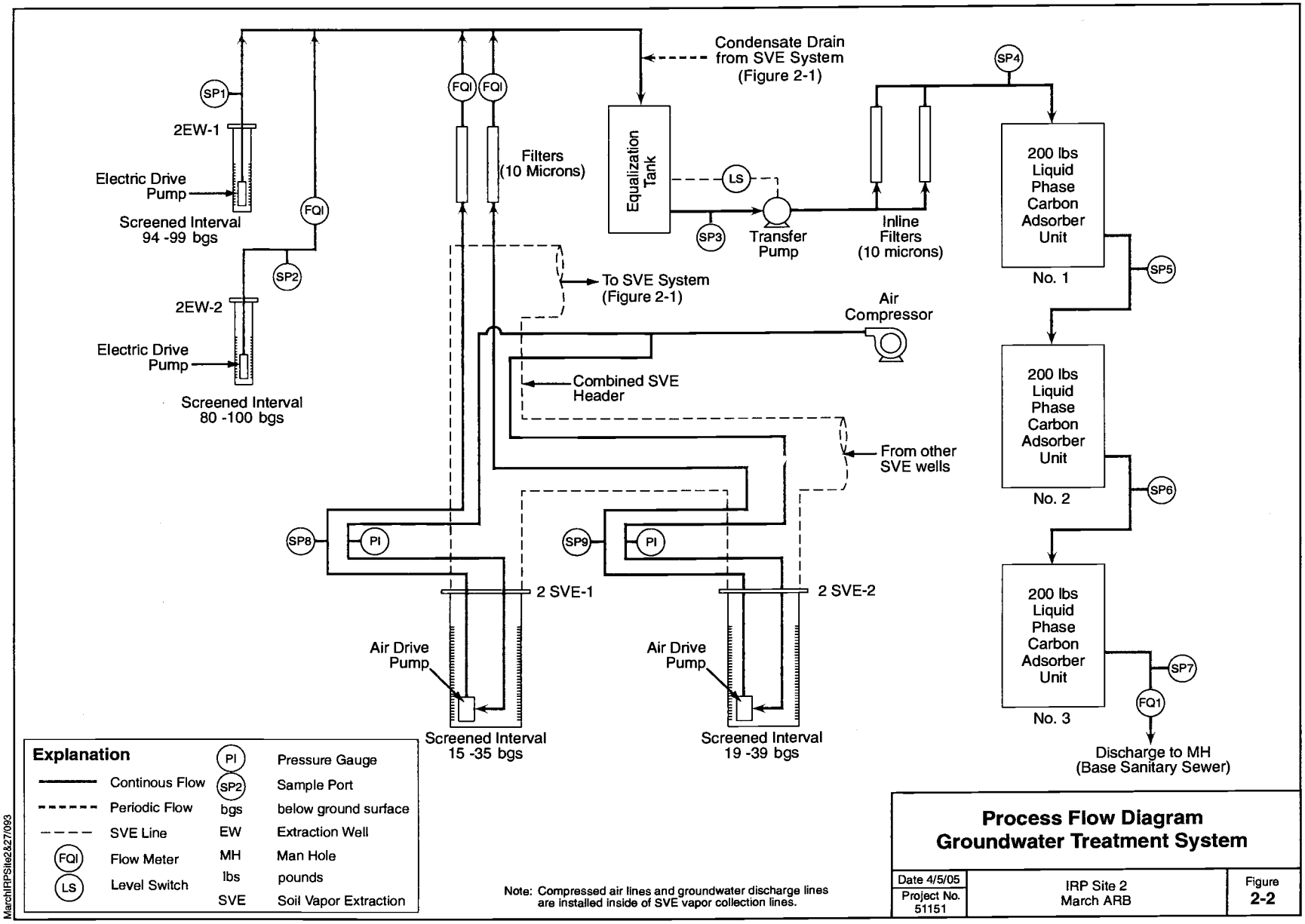
System monitoring and maintenance was performed to verify proper operation of the system, and included inspections of the equipment for excessive vibrations, system checks to verify tightness of the various pipe fittings and instrumentation connections, and recording of operating performance parameters. The SVE equipment is routinely maintained per manufacturer's instructions to ensure optimal operation. All maintenance activities are performed per instructions in the Treatability Implementation Plan (Earth Tech, 2002b) and documented in the Project Log Book. Wiring, ducting, mounting, hold-downs, and supports are inspected twice a month.

2.2 GROUNDWATER TREATMENT SYSTEM

A total of two groundwater extraction wells (2EW1 and 2EW2) were initially connected via underground piping to a GAC treatment facility on site. The GWTS was designed to process approximately 1 to 1.5 gallons per minute (gpm) from each well. Treated water is discharged directly to the base sanitary sewer


Dilution Air
Skid-Mounted SVE System
Discharge to Atmosphere
VSP2
VSP1
Blower (16hp) 250 scfm
SVEC
2000 lbs Vapor Phase Carbon Adsorber Unit
2000 lbs Vapor Phase Carbon Adsorber Unit
2000 lbs Vapor Phase Carbon Adsorber Unit
No. 1
No. 2
No. 3
Combined SVE Header
LS
Condensate Knockout
Transfer Pump
Condensate Drain to GWTS (Figure 2-2)
Well ID: 2SVE1 2SVE2 2SVE3 2SVE4 2SVE5
Screened Interval (bgs) 15'-35' 19'-39' 13'-33' 13'-33' 13'-33'
Explanation
Continuous Flow
Periodic Flow
Level Switch
Vapor Sample Port
bgs below ground surface
lbs pounds
scfm standard cubic feet per minute
Process Flow Diagram
Soil Vapor Extraction System
Date 4/5/05
Project No. 51151
IRP Site 2
March ARB
Figure 2-1
MarchIRPSite2&27/061

system. The GWTS at Site 2 was installed generally in accordance with the 100% design provided by MWH (2001b), with only minor modifications to the screened interval at 2EW2. The groundwater monitoring program at March ARB is conducted by the Basewide Groundwater Monitoring Program contractor. Currently, the GWTS is composed of two electric submersible pumps installed in extraction wells 2EW1 and 2EW2, and two pneumatic pumps installed in 2SVE1 and 2SVE2. Pneumatic pumps installed in 2SVE1 and 2SVE2 are used to dewater the submerged screened intervals in the two SVE wells and to increase vapor flow rates. The hoses for the pumps are installed inside the existing SVE pipeline and routed to the treatment compound. Extraction well 2EW1 is used to extract contaminated groundwater from the benzene plume situated beneath the former underground storage tanks (USTs) and extending west to IRP Site 27 situated just west of Graeber Street. Extraction well 2EW2 is situated just east of the former aboveground storage tank (AST) locations, near the suspected source of TCE. Groundwater from the four extraction pumps (2EW1, 2EW2, 2SVE1, and 2SVE2) enters a 300-gallon equalization tank via hoses and piping, is transferred by pump through two parallel in-line filter bag units, and is treated by passing the effluent through three 200-pound liquid-phase GAC canisters connected in series to remove organic compounds. The treated effluent water is then discharged to the base sanitary sewer system. The system is designed to treat a maximum average flow rate of 5 gpm. A schematic diagram for the GWTS is shown in Figure 2-2. Detailed manufacturer's cut-sheets and component specifications can be found in the IRP Sites 2 and 27 Treatability Implementation Plan (Earth Tech, 2002b) and Appendix C.


Condensate Drain from SVE System (Figure 2-1)
SP1
2EW-1
Electric Drive Pump
Screened Interval 94 -99 bgs
FQI
SP2
2EW-2
Electric Drive Pump
Screened Interval 80 -100 bgs
FQI
FQI
Filters (10 Microns)
Equalization Tank
LS
SP3
Transfer Pump
SP4
Inline Filters (10 microns)
200 lbs Liquid Phase Carbon Adsorber Unit
No. 1
SP5
200 lbs Liquid Phase Carbon Adsorber Unit
No. 2
SP6
200 lbs Liquid Phase Carbon Adsorber Unit
No. 3
SP7
FQ1
Discharge to MH (Base Sanitary Sewer)
To SVE System (Figure 2-1)
Air Compressor
Combined SVE Header
From other SVE wells
SP8
PI
SP9
PI
2 SVE-1
2 SVE-2
Air Drive Pump
Air Drive Pump
Screened Interval 15 -35 bgs
Screened Interval 19 -39 bgs
Explanation
Continous Flow
Periodic Flow
SVE Line
Flow Meter
Level Switch
PI Pressure Gauge
SP2 Sample Port
bgs below ground surface
EW Extraction Well
MH Man Hole
lbs pounds
SVE Soil Vapor Extraction
Note: Compressed air lines and groundwater discharge lines are installed inside of SVE vapor collection lines.
Process Flow Diagram
Groundwater Treatment System
Date 4/5/05
Project No. 51151
IRP Site 2
March ARB
Figure 2-2
MarchIRPSite2&27093

3.0 OPERATION AND MAINTENANCE ACTIVITIES

This section summarizes the O&M activities for the Site 2 SVE system and GWTS since startup with emphasis on the operational period between July 1 and September 30, 2004. Each system's O&M activities are discussed, followed by an evaluation of the system's operation, analytical results, and run time during this reporting period.

3.1 SUMMARY OF ACTIVITIES

Maintenance of the SVE system and GWTS has been performed as recommended by the manufacturers. System maintenance has been conducted twice a month to ensure satisfactory extraction well and treatment system performance, and to determine operating characteristics of the system. This section describes operation, maintenance, and monitoring activities of the Site 2 SVE system and GWTS during the reporting period.

3.1.1 SVE System

The thermal-oxidation unit treated vapors from three SVE wells (2SVE1, 2SVE2, and 2SVE5) from April 1 through June 16, 2004. On June 16, 2004, the existing thermal oxidizer SVE unit was shutdown, disconnected, and moved to IRP Site 27 because the combined influent soil vapor levels at Site 2 dropped below 500 ppmv. Installation of the new 250-scfm blower package, associated equipment, and three 2,000-pound vapor phase GAC vessels began on June 24, 2004. Full-scale operation of the new SVE GAC treatment system began on July 6, 2004 and continued for the balance of the quarter.

System monitoring was performed to verify proper operation of the system, and included inspections of the equipment for excessive vibrations, system checks to verify tightness of the various pipe fittings and instrumentation connections, and recording of operating performance parameters. The SVE equipment is routinely maintained per manufacturer's instructions to ensure optimal operation. All maintenance activities are performed per instructions in the Treatability Implementation Plan (Earth Tech, 2002b) and documented in the Project Log Book. Wiring, ducting, mounting, hold-downs, and supports are inspected weekly.

During the reporting period of July 1 to September 30, 2004, the system had approximately 2,010 hours of uptime, and processed approximately 6.7 million standard cubic feet (scf) of contaminated subsurface vapors. A breakdown of monthly system uptime hours and vapor processed is presented in Table 3-1.

The blower package is rated at 250 scfm at 8 inches of Hg but the system operated at a reduced flow rate of approximately 191 scfm during the reporting period. Flow from the SVE wells has averaged 56 scfm, and dilution air has been added at an average rate of approximately 135 scfm. The dilution air is provided to prevent overheating the blower motor.

Table 3-1. Summary of Monthly System Operation

Month	Uptime (hours)	Vapor Processed (scf)
2002		
June	477.2	1,498,992
July	648.3	2,558,021
August	688.6	2,803,747
September	695.1	2,830,214
October	655.5	2,669,173
November	574.3	2,338,336
December	472.7	1,924,881
2003		
January	643.4	2,311,715
February	663.1	2,382,422
March	545.4	1,894,161
April	625.1	1,646,832
May	530.4	1,079,933
June	645.0	1,195,663
July	729.2	1,281,972
August	715.1	1,157,777
September	692.3	1,144,222
October	612.1	996,949
November	573.0	933,266
December	629.6	2,488,230
2004		
January	638.1	2,445,403
February	696.0	2,500,589
March	723.2	2,944,755
April	695.6	2,748,988
May	740.5	2,571,751
June	260.5	873,395
July	546.1	1,831,126
August	744.0	2,494,840
September	720.0	2,414,362
Total	**17,597.1**	**55,961,713**

scf = standard cubic feet

Flow from individual SVE wells was measured every other week to monitor the progress. The monthly average flow rates for each SVE well and the combined influent from the SVE wells are presented in Table 3-2. The total flow rates from the SVE wells remained stable at approximately 56 scfm during the reporting period. In general, 2SVE1 and 2SVE2 contributed the majority of the total flow during this reporting period.

3.1.2 Groundwater Treatment System

During this reporting period, routine system monitoring and maintenance was conducted twice a month to ensure proper system performance. This consisted of checking operation of the submersible pumps, water levels in extraction wells, connectors and pipefittings, pressure gauges, and recording various system data in order to measure system performance. Nonroutine O&M required as a result of system improvement, inspection, and modification included the following:

Table 3-2. Average Flow Rate in SVE Wells and Combined Influent

	Average Flow Rate (scfm)					
Month	2SVE1	2SVE2	2SVE3	2SVE4	2SVE5	**All SVE Wells**
2002						
June	10.8	33.2	2.5	2.9	6.5	**55.9**
July	14.1	33.4	3.8	4.7	9.9	**65.9**
August	12.1	33.0	6.4	5.8	10.6	**67.9**
September	14.0	27.8	7.0	2.6	16.5	**67.9**
October	17.3	29.9	Closed	Closed	20.7	**67.9**
November	19.9	37.2	Closed	Closed	10.8	**67.9**
December	17.7	37.8	Closed	Closed	12.4	**67.9**
2003						
January	17.5	32.6	Closed	Closed	9.8	**59.9**
February	20.0	27.9	Closed	Closed	12.0	**59.9**
March	15.9	31.8	Closed	Closed	10.2	**57.9**
April	10.5	24.8	Closed	Closed	8.6	**43.9**
May	7.2	16.5	Closed	Closed	8.2	**31.9**
June	7.1	15.4	Closed	Closed	8.4	**30.9**
July	7.2	13.2	Closed	Closed	7.6	**28.0**
August	7.9	12.3	Closed	Closed	6.7	**26.9**
September	8.3	10.8	Closed	Closed	8.4	**27.5**
October	8.4	10.7	Closed	Closed	8.0	**27.2**
November	10.4	10.4	Closed	Closed	6.4	**27.2**
December	15.5	37.0	Closed	Closed	9.6	**62.1**
2004						
January	12.6	38.7	Closed	Closed	12.6	**63.9**
February	13.0	36.9	Closed	Closed	12.0	**61.9**
March	19.0	40.6	Closed	Closed	8.3	**67.9**
April	17.7	40.0	Closed	Closed	8.1	**65.8**
May	13.9	36.5	Closed	Closed	7.5	**57.9**
June	13.0	34.9	Closed	Closed	8.0	**55.9**
July	10.7	36.1	Closed	Closed	9.2	**55.9**
August	10.3	36.4	Closed	Closed	9.2	**55.9**
September	12.1	37.0	Closed	Closed	6.9	**55.9**

scfm = standard cubic feet per minute
SVE = soil vapor extraction

- July 1, 2004: the three canisters on the GAC System were reconfigured when GAC in the Number 2 vessel began showing contaminant breakthrough. The number 1 and 2 drums were replaced with new drums and the Number 3 drum was reconfigured to the Number 1 position. The two new drums became drums 2 and 3.

- July 14, 2004: the overload protector was replaced with two pair circuits so that the alarm callout could be wired to the motor overload.

- August 11, 2004: the GWTS holding tank was pressure washed to descale the tank's interior surface, filters were changed after the tank was cleaned.

- September 21, 2004: the lead drum of the GWTS was replaced. The series order of the drums was changed so the new drum would serve as the polisher of the groundwater stream.

- Groundwater samples from the outlet of the second GAC canister (SP-6, see Figure 2-2) were collected monthly to check for breakthrough of contaminants.

During the period July 1, 2004, to September 30, 2004, the system processed approximately 151,090 gallons of contaminated groundwater at an average flow rate of 1.17 gpm. Details of monthly system average flow rates and treated groundwater since startup are presented in Table 3-3.

Table 3-3. Summary of Monthly System Operation

Month	Groundwater Treated (gallons)	Combined Average Flow Rate (gpm)
2002		
June	64,190	1.72
July	59,830	1.28
August	39,600	0.98
September	42,820	0.93
October	38,330	0.87
November	36,110	0.78
December	42,060	0.95
2003		
January	40,330	0.90
February	30,130	0.75
March	33,240	0.83
April	28,630	0.86
May	47,710	0.82
June	31,480	0.78
July	38,470	0.87
August	26,870	0.69
September	26,400	0.65
October	28,830	0.72
November	39,060	0.82
December	54,880	1.26
2004		
January	42,420	1.06
February	41,550	0.69
March	59,530	1.37
April	42,220	1.39
May	49,170	1.27
June	53,000	1.02
July	45,880	1.14
August	45,260	1.21
September	59,950	1.15
Total	**1,187,950**	**Average = 0.97**

gpm = gallons per minute

3.2 VADOSE ZONE

This section describes vapor concentrations in the SVE wells, contaminant mass removed during this reporting period, and projected contaminant removal rate.

All analytical results for vapor samples collected during this reporting period have been validated and are presented in Appendix A. Data validation reports for the reporting period are presented in Appendix B.

3.2.1 Vapor Concentrations over Time

TPH concentrations for the combined influent increased from 160 ppmv on July 29, 2004, to 170 ppmv on August 24, 2004, and remained at 170 ppmv on September 30, 2004. Analytical results from the combined influent samples collected during the reporting period and previous sampling events are presented in Table 3-4. Figure 3-1 shows the plot of TPH concentrations in the combined influent versus the system run time since system startup.

TPH concentrations in 2SVE1 decreased from 1,300 ppmv to 510 ppmv. Concentrations in 2SVE2 decreased from 390 ppmv to 45 ppmv, and concentrations were not detected (ND) in 2SVE5, during the reporting period. Analytical results from the individual SVE well samples collected during the reporting period and previous sampling events are presented in Table 3-5.

During the reporting period, all three SVE extraction wells, the combined SVE well influent, and the SVE system effluent were monitored with a flame ionization detector (FID) twice a month to track the decline in vapor concentrations and monitor the system performance. Figure 3-2 presents plots of the FID readings in the individual SVE wells and the combined influent versus time. On July 29, 2004, an FID was used to monitor vapor concentrations in the shallow, middle, and deep zones in each of the four SVMPs (2SVMP1, 2SVMP2, 2SVMP3, and 2SVMP4). The results are summarized in Table 3-6 for the current and previous monitoring events. Between December 30, 2003, and July 29, 2004, FID readings generally decreased in all four SVMPs.

Monthly vapor samples collected from the system effluent were used to evaluate removal efficiencies and document compliance with South Coast Air Quality Management District (SCAQMD), and are presented in Table 3-7. Since the change from a thermal oxidizer to a vapor phase GAC system, the effluent sample point has been between GAC adsorber 2 and 3. When a rise in effluent emission concentration is noted at this sample point, the carbon in the lead number 1 carbon adsorber is scheduled for changeout. As shown, only minimal emissions have been detected in the effluent after steady-state operational conditions were established in July 2002. The change to a GAC SVE treatment system in July 2004 has not changed that fact.

Table 3-4. Analytical Results for Combined Influent

Sampling Date	Concentration (ppmv)				
	TPH	Benzene	Toluene	Ethylbenzene	Xylenes
2002					
June 6	34,000	220	500	43	135
June 12	31,000 B	160	630	92	280
July 10	10,000	37	190	28	74
August 13	8,000	230	160	30	95
September 4	4,700 B	120	75	17	45
October 8	2,900	2.5	46	16	43
November 21	3,900	86	58	19	64
December 20	2,900	76	62	12	36
2003					
January 14*	2,500	2.0	54	11	32
	2,500	1.7	48	10	31
February 24	2,300 B	51	34	10	30
March 27	1,900	43	31	8.4	29
April 23	1,700 B	37	28	7.3	26
May 21	1,600 B	51	41	9.7	35
June 30	1,300 B	0.94	28	8.1	28
July 31	1,200 B	35	26	7.4	28
August 27	1,100 B	37	27	7.3	28
September 24	1,000 B	0.52 J	22	1.7	18
October 22*	1,000 B	23	18	4.4	16
	1,000 B	23	18	4.4	16
November 24	900	26	20	5.6	23
December 30	1,000	24	12	5.5	23
2004					
January 27*	770	18	8.8	4.3	18
	750	18	8.9	4.2	17
March 9	670	16	7.3	3.8	16
April 7	540	9.9	4.5	2.8	13
April 29	390	ND	3.6	2.5	11
May 26	240	ND	3.2	1.8	7.6
July 29	160	ND	1.8	1.1	2.9
August 24*	170	ND	1.3	1.0	3.5
	170	ND	1.4	0.99	3.5
September 29	170	ND	0.96	1.1	3.1

* = duplicate
B = Method blank contamination. The associated method blank contains the target analyte at a detectable level.
J = Indicates an estimated concentration.
ppmv = parts per million by volume
TPH = total petroleum hydrocarbons (as gasoline)

Figure 3-1. Combined Influent TPH Concentration vs. System Runtime
March ARB Site 2 SVE

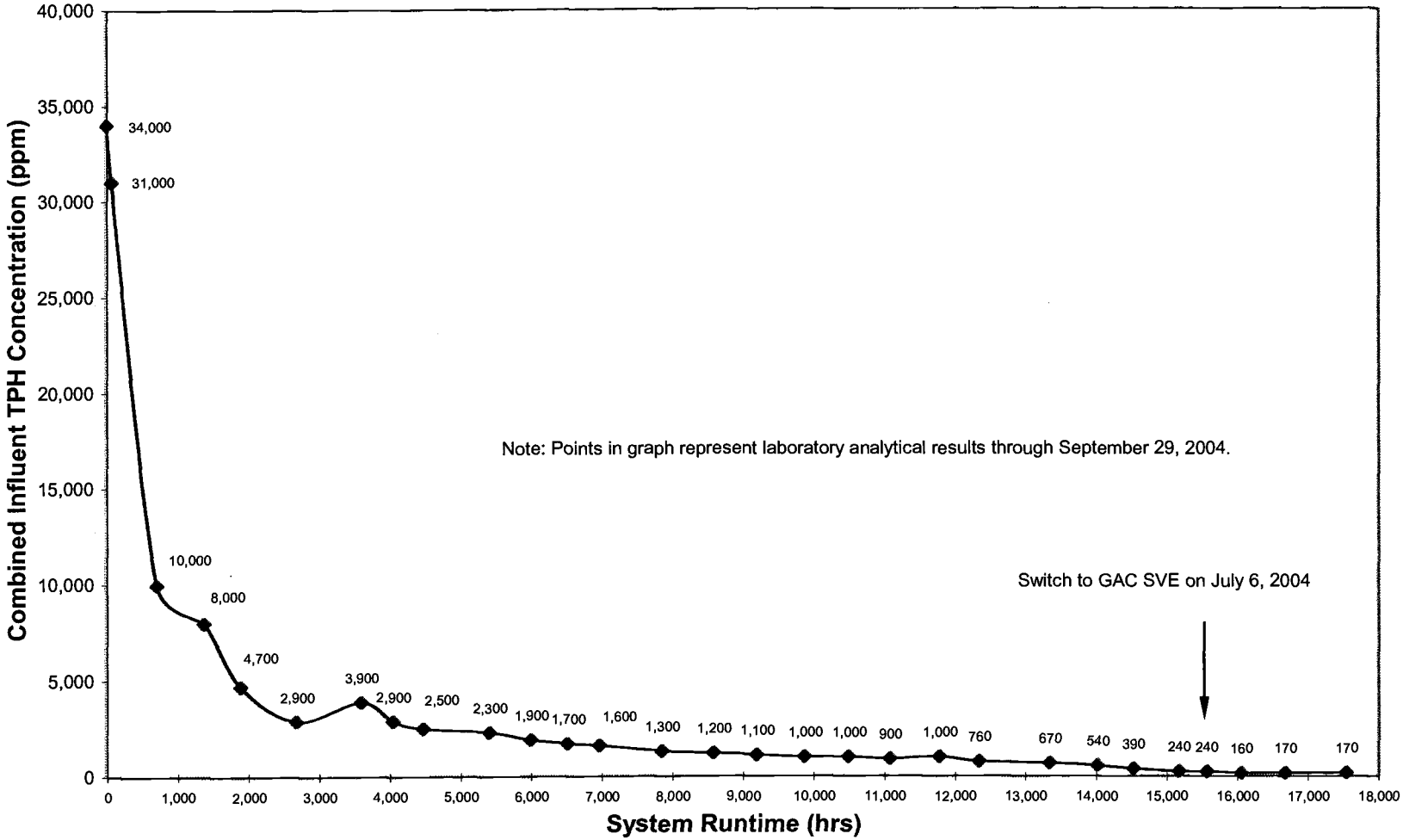


Table 3-5. Analytical Results for SVE Wells

ID Well	Concentration (ppmv)					
	TPH	Benzene	Toluene	Ethylbenzene	Xylenes	TCE
June 6, 2002						
2SVE1*	51,000	370	1,000	33	136	ND
	52,000	360	990	30	118	ND
2SVE2	40,000	180	360	58	172	ND
2SVE3	2.1 J	0.0027	0.016	0.0026	0.0163	0.00054 J
2SVE4	5.6	0.074	0.12	0.012	0.0457	ND
2SVE5	2.2	0.0015 J	0.0052	0.00094 J	0.0043	0.072
September 4, 2002						
2SVE1	7,600 B	260	140	15	40	NA
2SVE2	5,600 B	11	64	26	80	NA
2SVE3	3.0 J, B	0.0015 J	0.008	0.0021	0.0131	0.014
2SVE4*	4,400 B	59	28	11	40	NA
	5,600 B	74	36	15	52	NA
2SVE5	3.1 B	ND	0.0028	0.00062 J	0.005	0.034
December 20, 2002						
2SVE1	5,800	190	130	25	74	NA
2SVE2*	2,700	51	33	12	38	NA
	2,600	51	32	12	36	NA
2SVE5	2.4 B	ND	0.0017 J	ND	0.00309	0.0051 J
March 27, 2003						
2SVE1	3,300	110	7.2	16	60	NA
2SVE2	1,600	29	5.8	6.6	25	NA
2SVE5	2.0 J	ND	0.0013 J	ND	0.00245 J	0.0032
June 30, 2003**						
2SVE1	3,300 B	110	95	19	72	NA
2SVE2	1200 B	23	13	7.6	26	NA
2SVE5	1.2 J, B	ND	0.0012 J	ND	ND	0.0023 J
September 24, 2003						
2SVE1	1,700 B	0.76 J	8.0	35	26	NA
2SVE2	820 B	0.46 J	1.5	21	16	NA
2SVE5	2.4 J, B	ND V	0.00078 J, V	ND V	ND V	0.0024 J, V
December 30, 2003						
2SVE1*	1,700	49	38	11	48	NA
	1,700	49	39	11	49	NA
2SVE2	760	15	3.2	3.8	17	NA
2SVE5	ND	ND	ND	ND	ND	0.0067
April 7, 2004						
2SVE1	1,300	24	17	8.1	36	NA
2SVE2	390	7.4	0.79	1.7	6.6	NA
2SVE5*	ND	ND	ND	ND	ND	0.0029
	ND	ND	ND	ND	ND	0.0016 J
July 29, 2004						
2SVE1	510	ND	9.5	5.6	22	NA
2SVE2	45	ND	0.12	0.24	0.82	NA
2SVE5	ND	ND	ND	ND	ND	2.0

* = duplicate
** = 2SVE2 was sampled on 07/02/03. 2SVE1 was resampled on 07/31/03 due to anomalous analytical results from initial sampling event on 6/30/03.
B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.
J = Estimated result. Result is less than reporting limit.
NA = not analyzed
ND = not detected
ppmv = parts per million by volume
TCE = trichloroethylene
TPH = total petroleum hydrocarbons (as gasoline)
V = elevated reporting limit

Figure 3-2. FID Readings in SVE Wells and Combined Influent
June 2002 - September 2004
March ARB Site 2 SVE

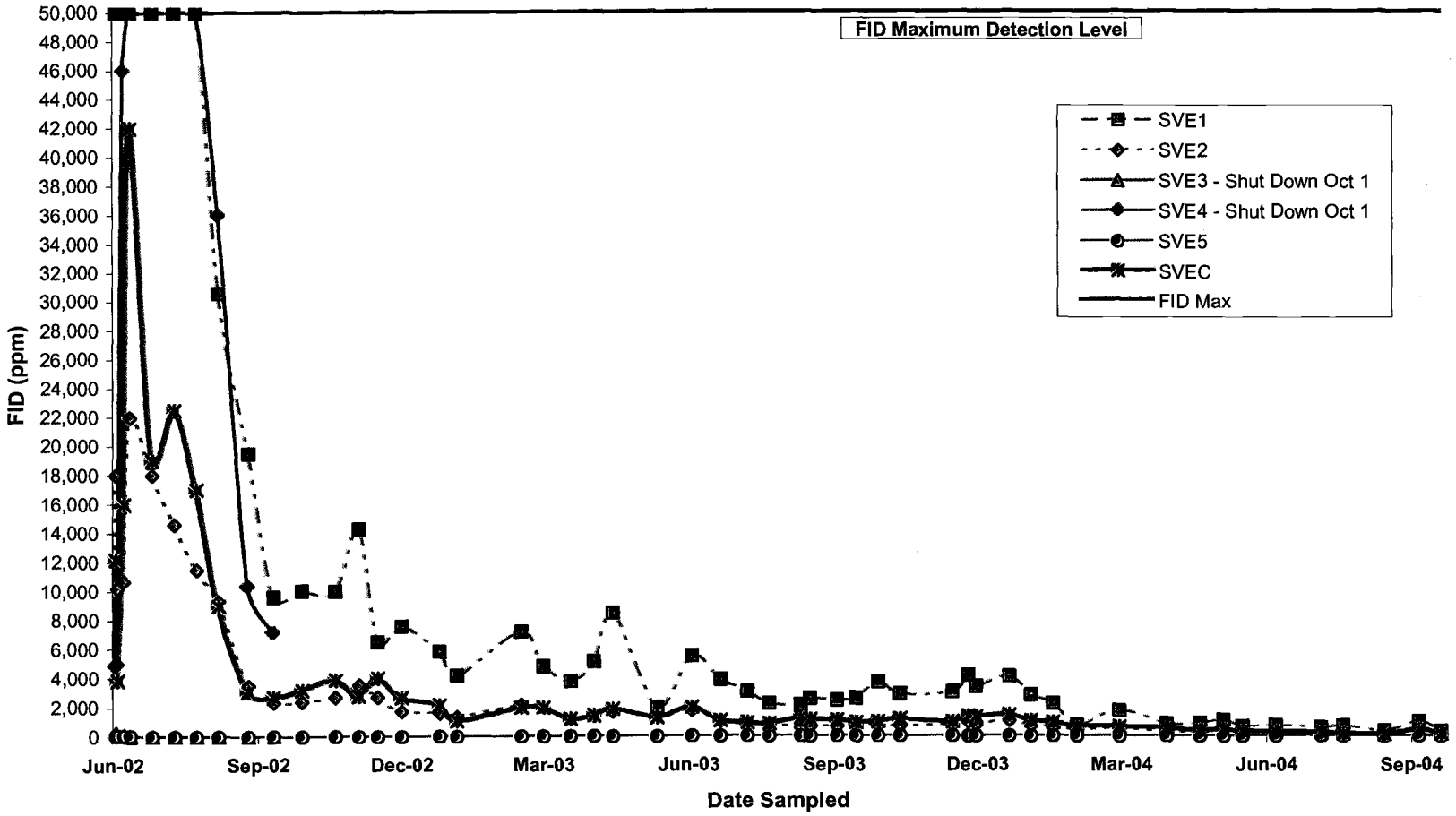


Table 3-6. FID Results for Soil Vapor Monitoring Points

Monitoring Point ID	Concentration (ppm)		
	Shallow Zone	Middle Zone	Deep Zone
November 19, 2002			
2SVMP1	1.70	25.74	58.12
2SVMP2	0.78	437	1,000
2SVMP3	1.45	1.27	1.78
2SVMP4	100	28,000	35,000
March 27, 2003			
2SVMP1	0.36	0.48	0.95
2SVMP2	3.16	2.65	440
2SVMP3	0.16	0.23	3.23
2SVMP4	43.89	5,800	3,415
June 30, 2003			
2SVMP1	0.00	0.00	0.00
2SVMP2	0.00	0.16	935
2SVMP3	0.00	0.00	Screen submerged in water
2SVMP4	32.50	500	850
September 24, 2003			
2SVMP1	0.00	1.80	Screen submerged in water
2SVMP2	0.00	0.00	725
2SVMP3	0.00	0.00	Screen submerged in water
2SVMP4	0.96	98.53	1427
December 30, 2003			
2SVMP1	0.00	1.86	Screen submerged in water
2SVMP2	0.00	0.00	1150
2SVMP3	0.00	0.00	Screen submerged in water
2SVMP4	0.29	230	1020
April 8, 2004			
2SVMP1	0.00	0.00	Screen submerged in water
2SVMP2	0.00	0.00	Screen submerged in water
2SVMP3	0.00	0.00	Screen submerged in water
2SVMP4	0.00	130	620
July 29, 2004			
2SVMP1	0.00	0.32	Screen submerged in water
2SVMP2	0.00	0.00	Screen submerged in water
2SVMP3	0.00	0.00	Screen submerged in water
2SVMP4	0.00	0.00	Screen submerged in water

Notes: For 2SVMP1, 2SVMP2, and 2SVMP3 the shallow, middle, and deep zones are typically screened 10.5-11, 20.5-21, and 31.5-32 feet below ground surface, respectively. For 2SVMP4 the shallow, middle, and deep zones are screened 15.5-18.5, 23.5-26.5, and 31.5-34.5 feet below ground surface, respectively.
ppm = parts per million

Table 3-7. Analytical Results for Effluent Emissions

Sampling Date	Concentration (ppmv)				
	TPH	Benzene	Toluene	Ethylbenzene	Xylenes
2002					
June 17	60 B	4.3	2.3	0.20	0.53
July 10	57	4.7	2.4	0.17	0.41
August 13	4.9 B	0.63	0.045	ND	0.011 J
September 4	0.52 J	ND	0.0092 J	ND	ND
October 8	NA	0.0046	0.0017 J	ND	ND
November 13*	0.73 J	0.0072 J	ND	ND	ND
	0.78 J	0.080	0.011 J	ND	ND
December 20	1.4 R	0.54 R	0.054 R	ND R	ND R
2003					
January 14	0.79 J	0.26	0.023	ND	ND
February 24	1.7 B	0.32	0.045	ND	ND
March 27	3.1 B	0.65	0.11	0.0058 J	0.031
April 23	3.1 B	0.57	0.12	ND	0.026
May 21	2.9 B	0.043	0.0093 J	ND	ND
June 30	1.8 B	0.039	0.011 J	ND	0.015 J
July 31	1.8	0.033	ND	ND	ND
August 27*	1.6	0.0050 J	0.0080 J	ND	0.011 J
	1.7	ND	ND	ND	ND
September 24	2.2	0.033	ND	ND	ND
October 22	2.0	ND	0.012 J	ND	ND
November 24	1.1	0.040	ND	ND	ND
December 30	ND	ND	ND	ND	ND
2004					
January 27	1.7	0.20	0.030	ND	ND
March 9	1.4	0.061	0.012 J	ND	0.015 J
April 7	1.1	0.029	ND	ND	0.0089 J
April 29	0.65 J/R	ND	ND	ND	ND
May 26	1.1	ND	ND	ND	ND
July 29	0.62J	ND	ND	ND	ND
August 24	0.54J	ND	0.0068J	ND	0.016J
September 29	0.41J	ND	ND	ND	ND

* = duplicate
B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.
J = Estimated result. Result is less than reporting limit.
NA = not analyzed
ND = not detected
ppmv = parts per million by volume
R = Rejected result. The sample was analyzed outside allotted holding time.
TPH = Total petroleum hydrocarbons (as gasoline)

3.2.2 Mass of Contaminants Removed

The mass of contaminants removed was calculated based upon the monthly contaminant concentrations at the SVE combined influent determined by laboratory analysis and the amount of vapor processed during the period. The mass of contaminants removed on a monthly basis is summarized in Table 3-8. During this reporting period (July 1 to September 30, 2004), the SVE removed a total of 288 pounds of TPH and 23 pounds of BTEX compounds. Figure 3-3 plots the cumulative pounds removed for TPH since system startup.

3.3 GROUNDWATER

This section describes concentrations in the groundwater extraction wells and amount of contaminants removed from contaminated groundwater during this reporting period (July 1 through September 30, 2004).

3.3.1 Groundwater Contaminant Concentrations

Groundwater samples were collected from all groundwater extraction wells on a monthly basis during the reporting period. Combined system effluent water samples from the GWTS were collected on a monthly basis to ensure no contaminants were released to the base sanitary sewer system. A sample from the outlet of the second GAC canister was also collected monthly to check for breakthrough of the contaminants.

All analytical results for water samples collected during this reporting period have been validated and are presented in Appendix A. Data validation reports for the reporting period are presented in Appendix B.

Analytical results for water samples collected from the combined influent and individual groundwater extraction wells during the reporting period and previous sampling events are presented in Tables 3-9 and 3-10, respectively. For comparison purposes, the combined influent results were calculated using the weighted average of analytical results from 2EW1 and 2EW2 between October 2002 and November 2003 and from 2EW1, 2EW2, 2SVE1, and 2SVE2 between December 2003 and September 2004.

During the reporting period, combined influent BTEX and TPH concentrations show a general decline. Benzene decreased from 685 micrograms per liter (µg/L) in July to 628 µg/L in September. TCE was stable at 5 µg/L in July and September. BTEX concentrations in the samples collected in 2EW1 also decreased slightly from July through September. Benzene decreased from 580 µg/L on July 29 to 480 µg/L on September 29 in 2EW1. TPH (gasoline) decreased from 8,900 µg/L on July 1 to 4,600 µg/L on September 29. BTEX and TCE concentrations in samples collected in 2EW2 also show a slight decreasing trend from July through September. Benzene decreased from 150 µg/L on July 29 to 130 µg/L on September 29 in 2EW2. TPH (diesel) showed the most significant decreasing trend from approximately 630 µg/L on July 1 to below

Table 3-8. Contaminant Removed Since System Startup

Month	Contaminant Removed (lbs)				
	TPH	Benzene	Toluene	Ethylbenzene	Xylenes
2002					
June	11,998	50	215	35	316
July	6,519	19	114	19	153
August	5,716	128	105	23	216
September	3,390	68	50	13	103
October	1,973	1	29	12	93
November	2,324	40	32	12	121
December	1,423	29	28	6	56
2003					
January	1,473	1	28	7	59
February	1,396	24	19	6	58
March	917	16	14	4	45
April	713	12	11	3	35
May	440	11	10	3	31
June	396	0.2	8	3	27
July	392	9	8	3	29
August	325	9	7	2	26
September	292	0.1	6	0.5	17
October	254	5	4	1	15
November	214	5	4	1	17
December	634	12	7	4	46
2004					
January	474	9	5	3	35
February	427	8	4	3	32
March	405	6	3	2	31
April	273	0	2	2	25
May	157	0	2	1	16
June	53	0	0.7	0.4	5
July	75	0	0.8	0.5	4
August	108	0	0.8	0.7	7
September	105	0	0.5	0.7	8
Total	**42,867**	**461**	**718**	**170**	**1,626**

lbs = pounds
TPH = total petroleum hydrocarbons (as gasoline)

Figure 3-3. Cumulative TPH Removal vs. System Run Time
March ARB Site 2 SVE

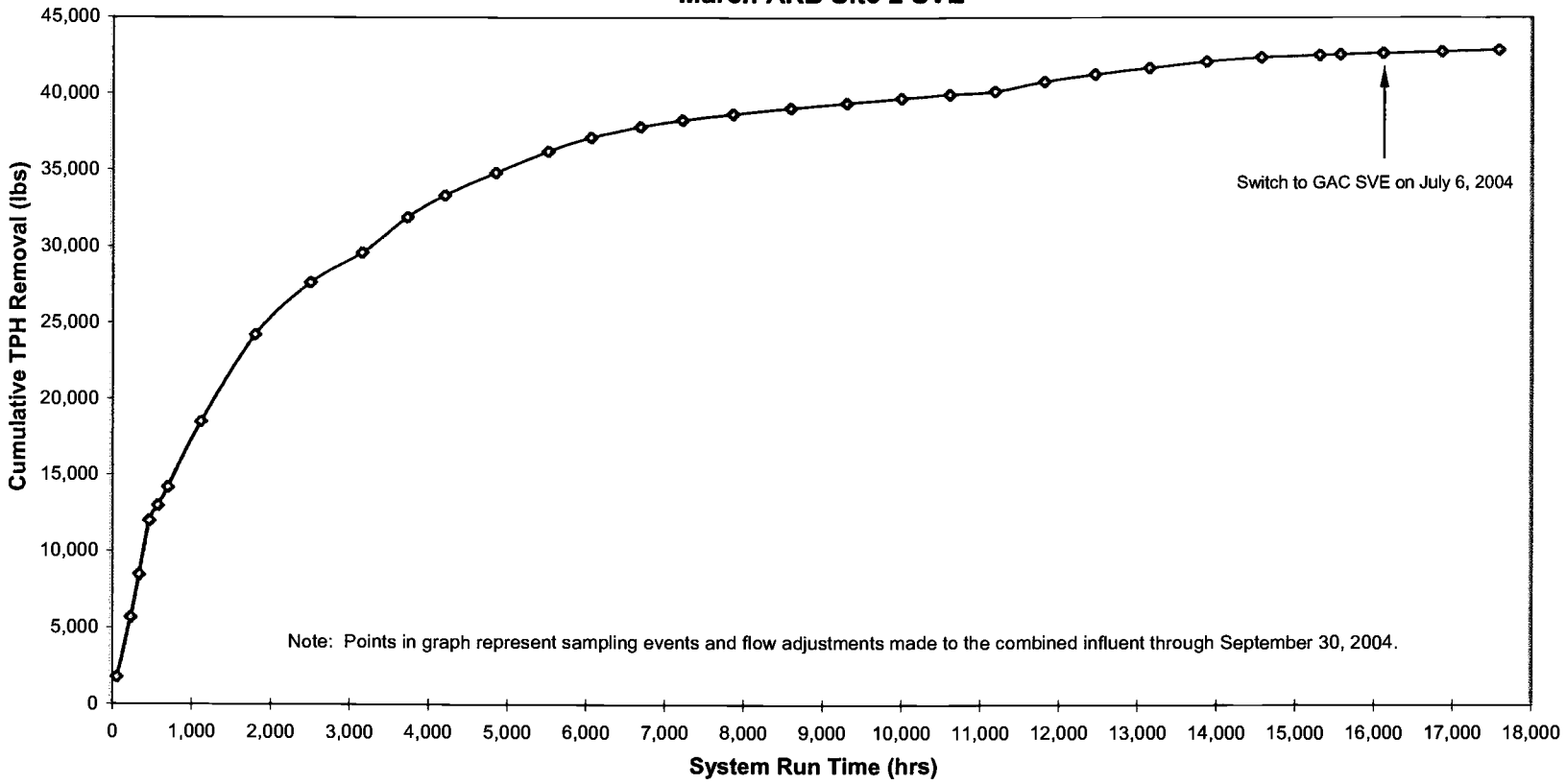


Table 3-9. Analytical Results for Groundwater Combined Influent

Sampling Date	Concentration (µg/L)						
	TPH (as gasoline)	TPH (as diesel)	Benzene	Toluene	Ethylbenzene	Xylenes	TCE
2002							
June 7	8,700	1,400	560	260	130	480	27
July 10	NA	NA	850	250	130	500	35
August 9*	NA	NA	900 J	310 J	130	520 J	18 J
	NA	NA	520 J	150 J	66	295 J	42
September 4	6,500	2,300	1,100	390	160	650	9.1 J
October 8	NA	NA	879	310	147	544	22
November 13	NA	NA	810	257	141	510	24
December 20	6,260	ND	560	188	108	377	19
2003							
January 14	NA	NA	651	190	108	391	24
February 23	NA	NA	927	247	139	473	17
March 27	4,880	1,573	812	244	132	485	29
April 23	NA	NA	777	226	120	471	19
May 21	NA	NA	521	141	71	298	11
June 26	6,942	934	1,024	186	136	462	24
July 29	NA	NA	651	154	96	370	13
August 27	NA	NA	479	106	74	261	15
September 24	5,701	ND	569	106	84	261	16
October 22	NA	NA	611	119	91	307	13
November 24	NA	NA	788	155	134	437	14
December 30	8,513	2,064	1,756	1,892	168	793	12
2004							
January 27	NA	NA	1,234	2,436	139	603	13
March 9	NA	NA	1,062	1,959	105	530	13
April 8	12,340	1,770	892	1,134	112	476	7
April 29	NA	NA	1,170	1,889	184	700	8
May 26	NA	NA	1,090	1,499	122	411	7
July 1	9,051	1,506	928	947	129	439	8
July 29	NA	NA	685	1045	68	368	5
August 24	NA	NA	645	1109	73	373	4
September 29	7,618	1,288	628	1019	70	353	5

Note: Results for October 2002 through September 2004 are calculated.
* = duplicate
µg/L = micrograms per liter
NA = not analyzed
ND = not detected
TCE = trichloroethylene
TPH = total petroleum hydrocarbons (as gasoline)

Table 3-10. Analytical Results for Groundwater Extraction Wells
Page 1 of 3

Well ID	Concentration (µg/L)						
	TPH (as gasoline)	TPH (as diesel)	Benzene	Toluene	Ethylbenzene	Xylenes	TCE
June 7, 2002							
2EW1	13,000	3,100	820	400	180	640	ND
2EW2	4,000	ND	68	22	27	84	53
September 4, 2002							
2EW1	13,000	3,300	1,200	500	210	830	ND
2EW2*	4,800	1,200	160	37	33	139	44
	4,500	1,100	160	38	35	150	46
October 8, 2002							
2EW1	NA	NA	1500	550	240	890	ND
2EW2	NA	NA	200	48	46	166	46
November 13, 2002							
2EW1	NA	NA	1300	420	210	760	ND
2EW2	NA	NA	240 M	67	61	220	51
December 20, 2002							
2EW1	9,900	ND	850	280	150	530	ND
2EW2	2,000	ND	220	80	58	197	42
January 14, 2003							
2EW1*	NA	NA	1,200	420 J	220 J	810 J	ND
	NA	NA	1,000	220 J	130 J	460 J	ND
2EW2	NA	NA	190	56	40	140	48
February 24, 2003							
2EW1	NA	NA	1,400	350	190	650	ND
2EW2	NA	NA	250	100	65	220	42
March 27, 2003							
2EW1	7,000	2,300	1,300	390	210	770	11 J
2EW2*	2,100	440	130	44 J	26 J	98	52
	1,700	660	120	32 J	17 J	73	58
April 23, 2003							
2EW1	NA	NA	1200	300	160	680	ND
2EW2	NA	NA	280	140	72	226	42
May 21, 2003							
2EW1*	NA	NA	690 J	170	86	390	ND
	NA	NA	1,000 J	220	110	500	ND
2EW2	NA	NA	160	81	41	134	24
June 26, 2003							
2EW1	9,600	1,700	1,700	270	220	740	ND
2EW2	3,700	ND	200	83	33 M	123	53
July 29, 2003							
2EW1	NA	NA	1,000	180	130	530	ND
2EW2	NA	NA	210	120	54	168	29
August 27, 2003							
2EW1	NA	NA	750	75	85	338	ND
2EW2*	NA	NA	220	130	62	182	30
	NA	NA	230	140	64	194	28
September 24, 2003							
2EW1*	7,500	ND	930	60	98	317	ND
	6,900	ND	990	74	110	359	ND
2EW2	4,400	ND	230	140	66	194	30

Table 3-10. Analytical Results for Groundwater Extraction Wells
Page 2 of 3

Well ID	Concentration (µg/L)						
	TPH (as gasoline)	TPH (as diesel)	Benzene	Toluene	Ethylbenzene	Xylenes	TCE
October 22, 2003							
2EW1	NA	NA	960	110	120	420	ND
2EW2*	NA	NA	240	140	64	196	31
	NA	NA	200	120	53	165	23
November 24, 2003							
2EW1	NA	NA	1200	180	190	630	ND
2EW2	NA	NA	210	120	56	167	34
December 9, 2003							
2SVE1	48,000	8,200	8,800	29,000	720	4,300	ND
2SVE2	9,600	3,500	2,600	780	210	1,100	ND
December 30, 2003							
2EW1	6,700	1,500	1,500	200	190	700	ND
2EW2	3,100	400	220	130	59	168	42
2SVE1	47,000	9,900	6,700	24,000	460	3,260	ND
2SVE2	7,200	2,600	2,200	1,100	110	760	ND
January 27, 2004							
2EW1	NA	NA	920	35	77	88	ND
2EW2	NA	NA	260	170	76	222	34
2SVE1*	NA	NA	6,700	25,000	650	4,300	ND
	NA	NA	6,700	25,000	650	4,200	ND
2SVE2	NA	NA	1,200	910	120	410	ND
March 9, 2004							
2EW1	NA	NA	1,400	150	160	680	ND
2EW2	NA	NA	160	81	34	96	24
2SVE1	NA	NA	6,100	21,000	560	3,550	ND
2SVE2*	NA	NA	1,300	860	120	550	ND
	NA	NA	1,400	860	110	540	ND
April 8, 2004							
2EW1*	12,000	1,000	700	81	98	355	ND
	16,000	1,000	650	68	86	316	ND
2EW2	3,100	430 J	140	47	27	75	25
2SVE1	96,000	7,700	5,600	18,000	570	3,560	ND
2SVE2	5,500	3,000	1,100	810	140	530	ND
April 29, 2004							
2EW1	NA	NA	780	84	110	400	ND
2EW2*	NA	NA	220	140	63	195	29
	NA	NA	230	140	66	207	27
2SVE1	NA	NA	6,600	25,000	750	4,400	ND
2SVE2	NA	NA	1,400	1,100	260	770	ND
May 26, 2004							
2EW1	NA	NA	710	35	73	171	ND
2EW2	NA	NA	220	110	54	153	22
2SVE1	NA	NA	5,200	19,000	500	2,940	ND
2SVE2	NA	NA	1,400	820 M	150	380	ND

Table 3-10. Analytical Results for Groundwater Extraction Wells
Page 3 of 3

Well ID	Concentration (µg/L)						
	TPH (as gasoline)	TPH (as diesel)	Benzene	Toluene	Ethylbenzene	Xylenes	TCE
July 1, 2004							
2EW1	8,900	740 J	690	34	84	186	ND
2EW2	6,400	630 J	210	110	63	182	22
2SVE1*	40,000	8,400	5,800	20,000	610	3,390	ND
	43,000	8,400	5,800	20,000	620	3,500	ND
2SVE2	8,400	2,900	1,600	780	220	750	ND
July 29, 2004							
2EW1*	NA	NA	580	17	41	102	ND
	NA	NA	520	18	54	110	ND
2EW2	NA	NA	150	81	46	135	18
2SVE1	NA	NA	4,200	17,000	490	3,050	ND
2SVE2	NA	NA	760	440	42	420	ND
August 24, 2004							
2EW1	NA	NA	500	17	58	116	ND
2EW2	NA	NA	140	79	47	139	15
2SVE1	NA	NA	3,800	15,000	450	2,790	ND
2SVE2*	NA	NA	600	420	40	350	ND
	NA	NA	630	430	43	360	ND
September 29, 2004							
2EW1	4,200	510	480	11	49	92	ND
2EW2*	4,600	ND	150	80	50	148	17
	4,600	ND	130	70	40	125	17
2SVE1	56,000	7,600	4,300	16,000	520	3,020	ND
2SVE2	5,600	2,000	590	360	38	339	ND

* = duplicate
J = estimated result
M = matrix effect
µg/L = micrograms per liter
NA = not analyzed
ND = not detected
TCE = trichloroethylene
TPH = total petroleum hydrocarbons

detection limits on September 29 in 2EW2. TCE decreased slightly from 18 µg/L on July 29 to 17 µg/L on September 29 in 2EW2. In general, BTEX concentrations increased slightly in the samples collected in 2SVE1 from July through September. Benzene increased from 4,200 µg/L on July 29 to 4,300 µg/L on September 1 in 2SVE1. TPH (gasoline) increased from 43,000 µg/L in 2SVE1 on July 29 to 56,000 µg/L on September 29. In general, BTEX concentrations in the samples collected in 2SVE2 showed a decreasing trend from July through September. Benzene decreased from 760 µg/L on July 29 to 590 µg/L on September 29 in 2SVE2. TPH (gasoline) decreased from 8,400 µg/L on July 29 to 5,600 µg/L on September 29.

3.3.2 Mass of Contaminants Removed

The mass of contaminants removed was calculated based upon the monthly contaminant concentrations from the individual extraction wells as determined by laboratory analysis and from the amount of groundwater processed during the reporting period. The amount of contaminant mass removed on a monthly basis since startup is summarized in Table 3-11. During this reporting period (July 1, 2004, to September 30, 2004), the GWTS removed a total of 12.27 pounds of TPH, 2.69 pounds of BTEX compounds, and 0.006 pound of TCE.

Table 3-11. Contaminant Removed Since System Startup

	Contaminant Removed (lbs)						
Month	TPH (as gasoline)	TPH (as diesel)	Benzene	Toluene	Ethylbenzene	Xylenes	TCE
2002							
June	4.07	0.99	0.30	0.14	0.07	0.26	0.014
July	3.79	0.92	0.42	0.12	0.06	0.25	0.017
August	2.51	0.61	0.23	0.08	0.03	0.13	0.010
September	2.72	0.66	0.39	0.14	0.06	0.23	0.003
October	2.04	0.37	0.28	0.10	0.05	0.17	0.007
November	1.92	0.35	0.24	0.08	0.04	0.15	0.007
December	2.24	0.40	0.20	0.07	0.04	0.13	0.007
2003							
January	1.87	0.26	0.22	0.06	0.04	0.13	0.008
February	1.40	0.20	0.23	0.06	0.03	0.12	0.004
March	1.55	0.22	0.23	0.07	0.04	0.13	0.008
April	1.41	0.30	0.19	0.05	0.03	0.11	0.005
May	2.35	0.20	0.21	0.06	0.03	0.12	0.005
June	1.55	0.33	0.27	0.05	0.04	0.12	0.006
July	2.03	0.15	0.21	0.05	0.03	0.12	0.004
August	1.42	0.10	0.11	0.02	0.02	0.06	0.003
September	1.39	0.10	0.13	0.02	0.02	0.06	0.004
October	1.71	0.25	0.15	0.03	0.02	0.07	0.003
November	2.32	0.34	0.26	0.05	0.04	0.14	0.005
December	3.25	0.47	0.96	1.03	0.09	0.43	0.006
2004							
January	3.69	0.79	0.44	0.86	0.05	0.21	0.005
February	3.62	0.77	0.37	0.68	0.04	0.18	0.005
March	5.18	1.11	0.44	0.56	0.06	0.24	0.003
April	3.77	0.58	0.45	0.67	0.06	0.25	0.003
May	4.39	0.67	0.41	0.62	0.05	0.17	0.003
June	4.73	0.72	0.45	0.42	0.06	0.19	0.003
July	3.19	0.53	0.26	0.40	0.03	0.14	0.002
August	3.15	0.53	0.24	0.42	0.03	0.14	0.002
September	4.17	0.70	0.31	0.51	0.03	0.16	0.002
Total	**77.44**	**13.93**	**8.55**	**7.41**	**1.18**	**4.66**	**0.154**

lbs = pounds
TCE = trichloroethylene
TPH = total petroleum hydrocarbons

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4.0 CONCLUSIONS AND RECOMMENDATIONS

The SVE system and GWTS continue to effectively remove and treat contaminated vapors and groundwater from the subsurface at IRP Site 2 at March ARB. System evaluation and recommendations for the SVE system and GWTS are discussed in the following section.

4.1 VADOSE ZONE

The original SVE system was designed and operated to extract contaminated vapors from all five SVE wells screened in the vadose zone at IRP Site 2. The new GAC-based SVE system is designed and operated to extract vapors from the three wells that are currently open. During this operational period, the SVE system operated approximately 2,010 hours (July 1 through September 30, 2004). Approximately 6.7 million scf of contaminated vapors were treated, from which approximately 287 pounds of TPH and 21 pounds of BTEX compounds were removed.

Although the SVE system blower is rated at 250 scfm, it operated at a reduced flow rate of approximately 191 scfm during most of this reporting period, of which approximately 56 scfm was generated from the three open SVE wells and 135 scfm was dilution air. The blower has functioned as designed, providing adequate vacuum (80 inches of water column or better) in the SVE well network.

4.1.1 Recommended Well Field Operation

Two SVE wells, 2SVE3 and 2SVE4, have been shut down since October 1, 2002, to optimize system operation. The remaining three SVE wells, 2SVE1, 2SVE2, and 2SVE5, will continue to be operated. SVE wells 2SVE1 and 2SVE2 are centrally situated in the area of contamination caused by the former USTs, and provide effective coverage to fully remediate the site. SVE well 2SVE5, situated just west of the former AST locations, near the suspected source of TCE, provides adequate coverage for the suspected chlorinated solvent source area.

The two SVE wells that have been shut down (2SVE3 and 2SVE4), and 2SVMP4 (shallow, intermediate, and deep zones) were converted to venting wells in June 2003 to modify subsurface flow paths and facilitate remediation of any stagnation zones.

Flow from 2SVE1 and 2SVE2 had dropped considerably beginning in March 2003. A noticeable rise in the groundwater levels in the area and rise in the water columns when vacuum is applied was noted in the extraction wells, and it appeared that the reduced flow was attributable to the loss in dry soil vapor extraction well screen lengths. Some screened intervals had as much as 10 feet of screen being submerged in water when vacuum is applied. Installation of pneumatic pumps in 2SVE1 and 2SVE2 to dewater the submerged screen lengths was completed in November 2003. Full-scale operation of the pneumatic

pumps installed in 2SVE1 and 2SVE2 began on December 2, 2003. An increase in the vapor flow rates from 2SVE1 and 2SVE2 was noted immediately after operation of the pneumatic pumps commenced. As of December 31, 2003, the vapor flow rates from 2SVE1 and 2SVE2 were near levels measured before the rise of the water table occurred.

4.2 GROUNDWATER

The GWTS is operating as designed to extract and treat contaminated groundwater from the benzene plume centered at the western edge of the site, and from the eastern end of the site near the suspected source of TCE. Pneumatic pumps were installed in 2SVE1 and 2SVE2 to dewater the submerged screened intervals and increase vapor flow rates in late 2003. The hoses for the pumps were installed inside the existing SVE pipeline and routed to the treatment compound. Groundwater from the four extraction pumps (2EW1, 2EW2, 2SVE1, and 2SVE2) enters a 300-gallon equalization tank before being transferred via pump to the existing filtration and GAC system. Although the system is constructed to reflect the anticipated flow rate of 1.5 gpm per well, it has operated at an average flow rate of approximately 1.19 gpm during the majority of this reporting period. Approximately 151,090 gallons of contaminated groundwater were treated from July 1 through September 30, 2004, from which approximately 12.3 pounds of TPH, 2.69 pounds of BTEX compounds, and 0.006 pound of TCE were removed.

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Appendix A
Analytical Results

FINAL DATA - PRINTED 02/16/2005
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	Base		MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH		
	Site		Site 2			Site 2			Site 2			Site 2			Site 2			Site 2			Site 2		
	Point		2-SVE01			2-SVE02			2-SVE05			2-SVEC			2-SVEC			2-SVEC			2-SVEC		
	Sampling Date		07/29/2004 11:50			07/29/2004 12:05			07/29/2004 11:25			07/29/2004 13:20			08/24/2004 13:00			08/24/2004 13:00			09/29/2004 11:15		
	Sample Depth		-			-			-			-			-			-			-		
	Sample Type		N1			N1			N1			N1			N1			FD1			N1		
	Field Sample		2-SVE1-VS12			2-SVE2-VS10			2-SVE5-VS10			2-SVEC-VS29			2-SVEC-VS30			2-SVEC-VS31			2-SVEC-VS32		
	Lab Sample		E4H030308-001			E4H030308-002			E4H030308-003			E4H030308-004			E4H260378-001			E4H260378-002			E4J020153-001		
	PVC / Run		PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1		
	Status		*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*		
Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
benzene	TO3	ppm v/v	ND		[0.37, 18.73]	ND		[0.035, 1.75]	-			ND		[0.041, 2.03]	ND		[0.12, 5.78]	ND		[0.12, 5.81]	ND		[0.045, 2.23]
ethylbenzene	TO3	ppm v/v	**5.6**		[0.37, 18.73]	**0.24**		[0.035, 1.75]	-			**1.1**		[0.041, 2.03]	**1.0**		[0.12, 5.78]	**0.99**		[0.12, 5.81]	**1.1**		[0.045, 2.23]
methyl tert-butyl ether (MTBE)	TO3	ppm v/v	ND		[0.37, 18.73]	ND		[0.035, 1.75]	-			ND		[0.041, 2.03]	ND		[0.12, 5.78]	ND		[0.12, 5.81]	**0.040 J**		[0.045, 2.23]
PHC as gasoline	TO3	ppm v/v	**510**		[19, 18.73]	**45**		[1.8, 1.75]	ND		[2.8, 2.78]	**160**		[2.0, 2.03]	**170**		[5.8, 5.78]	**170**		[5.8, 5.81]	**170 B**		[2.3, 2.26]
toluene	TO3	ppm v/v	**9.5**		[0.37, 18.73]	**0.12**		[0.035, 1.75]	-			**1.8**		[0.041, 2.03]	**1.3**		[0.12, 5.78]	**1.4**		[0.12, 5.81]	**0.96**		[0.045, 2.23]
xylenes, total	TO3	ppm v/v	**22**		[0.37, 18.73]	**0.82**		[0.035, 1.75]	-			**2.9**		[0.041, 2.03]	**3.5**		[0.12, 5.78]	**3.5**		[0.12, 5.81]	**3.1**		[0.045, 2.23]

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	Base		MARCH			MARCH			MARCH		
	Site		Site 2			Site 2			Site 2		
	Point		2-VSP02			2-VSP02			2-VSP02		
	Sampling Date		07/29/2004 14:30			08/24/2004 12:45			09/29/2004 13:50		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		2-VSP2-VS27			2-VSP2-VS28			2-VSP2-VS29		
	Lab Sample		E4G300278-001			E4H250196-001			E4I300284-001		
	PVC / Run		PR / 1			PR / 1			PR / 1		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
benzene	TO3	ppm v/v	ND		[0.020, 1]	ND		[0.020, 1]	ND	R	[0.020, 1]
ethylbenzene	TO3	ppm v/v	ND		[0.020, 1]	ND		[0.020, 1]	ND	R	[0.020, 1]
methyl tert-butyl ether (MTBE)	TO3	ppm v/v	ND		[0.020, 1]	ND		[0.020, 1]	ND	R	[0.020, 1]
PHC as gasoline	TO3	ppm v/v	**0.62 J**		[1.0, 1]	**0.54 J**		[1.0, 1]	**0.41 J**	R	[1.0, 1]
toluene	TO3	ppm v/v	ND		[0.020, 1]	**0.0068 J**		[0.020, 1]	ND	R	[0.020, 1]
xylenes, total	TO3	ppm v/v	ND		[0.020, 1]	**0.016 J**		[0.020, 1]	ND	R	[0.020, 1]

FINAL DATA - PRINTED 02/16/2005
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	Base	MARCH	MARCH	MARCH	MARCH	MARCH	MARCH	MARCH	MARCH
	Site	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2
	Point	2-SP01	2-SP01	2-SP01	2-SP01	2-SP01	2-SP02	2-SP02	2-SP02
	Sampling Date	07/01/2004 14:20	07/29/2004 12:10	07/29/2004 12:10	08/24/2004 11:45	09/29/2004 12:30	07/01/2004 14:35	07/29/2004 12:30	08/24/2004 11:55
	Sample Depth	-	-	-	-	-	-	-	-
	Sample Type	N1	N1	FD1	N1	N1	N1	N1	N1
	Field Sample	2-SP1-WG027	2-SP1-WG028	2-SP1-WG029	2-SP1-WG030	2-SP1-WG031	2-SP2-WG028	2-SP2-WG029	2-SP2-WG030
	Lab Sample	E4G020212-001	E4H020205-002	E4H020205-003	E4H250185-001	E4I300373-001	E4G020212-002	E4H020205-004	E4H250185-002
	PVC / Run	PR / 1	PR / 1	PR / 1	PR / 1	PR / 1	PR / 1	PR / 1	PR / 1
	Status	*Validated*	*Validated*	*Validated*	*Validated*	*Validated*	*Validated*	*Validated*	*Validated*

Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
benzene	SW8260B	µg/L	**690**		[12, 12.5]	**580**		[10, 10]	**520**		[10, 10]	**500**		[10, 10]	**480**		[12, 12.5]	**210**		[3.3, 3.33]	**150**		[2.5, 2.5]	**140**		[2.5, 2.5]
bromobenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
bromochloromethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
bromodichloromethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
bromoform	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
bromomethane	SW8260B	µg/L	ND		[25, 12.5]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[6.7, 3.33]	ND		[5.0, 2.5]	ND		[5.0, 2.5]
n-butylbenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
sec-butylbenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
tert-butylbenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
carbon tetrachloride	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
chlorobenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
chloroethane	SW8260B	µg/L	ND		[25, 12.5]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[6.7, 3.33]	ND		[5.0, 2.5]	ND		[5.0, 2.5]
chloroform	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	**1.5 J**		[3.3, 3.33]	ND		[2.5, 2.5]	**1.2 J**		[2.5, 2.5]
chloromethane	SW8260B	µg/L	ND		[25, 12.5]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[6.7, 3.33]	ND		[5.0, 2.5]	ND		[5.0, 2.5]
2-chlorotoluene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
4-chlorotoluene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,2-dibromo-3-chloropropane	SW8260B	µg/L	ND		[25, 12.5]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[6.7, 3.33]	ND		[5.0, 2.5]	ND		[5.0, 2.5]
dibromochloromethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
dibromomethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,2-dichlorobenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,3-dichlorobenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,4-dichlorobenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
dichlorodifluoromethane	SW8260B	µg/L	ND		[25, 12.5]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[6.7, 3.33]	ND		[5.0, 2.5]	ND		[5.0, 2.5]
1,1-dichloroethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,2-dichloroethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,1-dichloroethene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
cis-1,2-dichloroethene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	**7.8**		[3.3, 3.33]	**5.9**		[2.5, 2.5]	**5.7**		[2.5, 2.5]
trans-1,2-dichloroethene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,2-dichloropropane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,3-dichloropropane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
2,2-dichloropropane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,1-dichloropropene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
cis-1,3-dichloropropene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
trans-1,3-dichloropropene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
ethylbenzene	SW8260B	µg/L	**84**		[12, 12.5]	**41**		[10, 10]	**54**		[10, 10]	**58**		[10, 10]	**49**		[12, 12.5]	**63**		[3.3, 3.33]	**46**		[2.5, 2.5]	**47**		[2.5, 2.5]
ethylene dibromide (EDB)	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
hexachlorobutadiene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
isopropylbenzene	SW8260B	µg/L	**8.8 J**		[12, 12.5]	**4.9 J**		[10, 10]	**5.2 J**		[10, 10]	**5.0 J**		[10, 10]	**5.1 J**		[12, 12.5]	**6.1**		[3.3, 3.33]	**4.1**		[2.5, 2.5]	**4.2**		[2.5, 2.5]
p-isopropyltoluene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
methyl tert-butyl ether (MTBE)	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
methylene chloride	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	**1.1 J**		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
naphthalene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
n-propylbenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	**2.2 J**		[3.3, 3.33]	**1.5 J**		[2.5, 2.5]	**1.6 J**		[2.5, 2.5]

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	Base	MARCH	MARCH	MARCH	MARCH	MARCH	MARCH	MARCH	MARCH
	Site	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2	Site 2
	Point	2-SP01	2-SP01	2-SP01	2-SP01	2-SP01	2-SP02	2-SP02	2-SP02
	Sampling Date	07/01/2004 14:20	07/29/2004 12:10	07/29/2004 12:10	08/24/2004 11:45	09/29/2004 12:30	07/01/2004 14:35	07/29/2004 12:30	08/24/2004 11:55
	Sample Depth	-	-	-	-	-	-	-	-
	Sample Type	N1	N1	FD1	N1	N1	N1	N1	N1
	Field Sample	2-SP1-WG027	2-SP1-WG028	2-SP1-WG029	2-SP1-WG030	2-SP1-WG031	2-SP2-WG028	2-SP2-WG029	2-SP2-WG030
	Lab Sample	E4G020212-001	E4H020205-002	E4H020205-003	E4H250185-001	E4I300373-001	E4G020212-002	E4H020205-004	E4H250185-002
	PVC / Run	PR / 1	PR / 1	PR / 1	PR / 1	PR / 1	PR / 1	PR / 1	PR / 1
	Status	*Validated*	*Validated*	*Validated*	*Validated*	*Validated*	*Validated*	*Validated*	*Validated*

Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
styrene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,1,1,2-tetrachloroethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,1,2,2-tetrachloroethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
tetrachloroethene (PCE)	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
toluene	SW8260B	µg/L	**34**		[12, 12.5]	**17**		[10, 10]	**18**		[10, 10]	**17**		[10, 10]	**11 J**		[12, 12.5]	**110**		[3.3, 3.33]	**81**		[2.5, 2.5]	**79**		[2.5, 2.5]
1,2,3-trichlorobenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,2,4-trichlorobenzene	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,1,1-trichloroethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,1,2-trichloroethane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
trichloroethene (TCE)	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	**22**		[3.3, 3.33]	**18**		[2.5, 2.5]	**15**		[2.5, 2.5]
trichlorofluoromethane	SW8260B	µg/L	ND		[25, 12.5]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[6.7, 3.33]	ND		[5.0, 2.5]	ND		[5.0, 2.5]
1,2,3-trichloropropane	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
1,2,4-trimethylbenzene	SW8260B	µg/L	**4.1 J**		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	**3.1 J**		[3.3, 3.33]	**1.9 J**		[2.5, 2.5]	**1.7 J**		[2.5, 2.5]
1,3,5-trimethylbenzene	SW8260B	µg/L	**3.2 J**		[12, 12.5]	**2.0 J**		[10, 10]	ND		[10, 10]	**2.0 J**		[10, 10]	ND		[12, 12.5]	**3.0 J**		[3.3, 3.33]	**1.9 J**		[2.5, 2.5]	**2.0 J**		[2.5, 2.5]
vinyl chloride	SW8260B	µg/L	ND		[12, 12.5]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[3.3, 3.33]	ND		[2.5, 2.5]	ND		[2.5, 2.5]
m- & p-xylene	SW8260B	µg/L	**150**		[12, 12.5]	**82**		[10, 10]	**92**		[10, 10]	**100**		[10, 10]	**82**		[12, 12.5]	**130**		[3.3, 3.33]	**98**		[2.5, 2.5]	**100**		[2.5, 2.5]
o-xylene	SW8260B	µg/L	**36**		[12, 12.5]	**20**		[10, 10]	**18**		[10, 10]	**16**		[10, 10]	**9.9 J**		[12, 12.5]	**52**		[3.3, 3.33]	**37**		[2.5, 2.5]	**39**		[2.5, 2.5]

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	Base		MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH		
	Site		Site 2			Site 2			Site 2			Site 2			Site 2			Site 2			Site 2			Site 2		
	Point		2-SP02			2-SP02			2-SP06			2-SP06			2-SP06			2-SP06			2-SP07			2-SP07		
	Sampling Date		09/29/2004 13:30			09/29/2004 13:30			07/01/2004 14:50			07/29/2004 12:40			08/24/2004 12:10			09/29/2004 11:25			07/01/2004 14:55			07/29/2004 12:35		
	Sample Depth		-			-			-			-			-			-			-			-		
	Sample Type		N1			FD1			N1			N1			N1			N1			N1			N1		
	Field Sample		2-SP2-WG031			2-SP2-WG032			2-SP6-WG023			2-SP6-WG024			2-SP6-WG025			2-SP6-WG026			2-SP7-WG027			2-SP7-WG028		
	Lab Sample		E4I300373-002			E4I300373-003			E4G020212-003			E4H020205-005			E4H250185-003			E4I300373-004			E4G020212-004			E4H020205-006		
	PVC / Run		PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1		
	Status		*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*		
Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
benzene	SW8260B	µg/L	**150**		[2.5, 2.5]	**130**		[2.5, 2.5]	ND		[1.0, 1]	**9.6**		[1.0, 1]	**51**		[1.0, 1]	**9.4**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromobenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromochloromethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromodichloromethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromoform	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromomethane	SW8260B	µg/L	ND		[5.0, 2.5]	ND		[5.0, 2.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
n-butylbenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
sec-butylbenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
tert-butylbenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	**0.44 J**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
carbon tetrachloride	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
chlorobenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
chloroethane	SW8260B	µg/L	ND		[5.0, 2.5]	ND		[5.0, 2.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
chloroform	SW8260B	µg/L	ND		[2.5, 2.5]	**1.3 J**		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
chloromethane	SW8260B	µg/L	ND		[5.0, 2.5]	ND		[5.0, 2.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
2-chlorotoluene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
4-chlorotoluene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2-dibromo-3-chloropropane	SW8260B	µg/L	ND		[5.0, 2.5]	ND		[5.0, 2.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
dibromochloromethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
dibromomethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2-dichlorobenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,3-dichlorobenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,4-dichlorobenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
dichlorodifluoromethane	SW8260B	µg/L	ND		[5.0, 2.5]	ND		[5.0, 2.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
1,1-dichloroethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2-dichloroethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	**2.2**		[1.0, 1]	**0.43 J**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1-dichloroethene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
cis-1,2-dichloroethene	SW8260B	µg/L	**7.4**		[2.5, 2.5]	**6.7**		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	**0.49 J**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
trans-1,2-dichloroethene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2-dichloropropane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,3-dichloropropane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
2,2-dichloropropane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1-dichloropropene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
cis-1,3-dichloropropene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
trans-1,3-dichloropropene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
ethylbenzene	SW8260B	µg/L	**50**		[2.5, 2.5]	**44**		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	**0.22 J**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
ethylene dibromide (EDB)	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	**3.1**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
hexachlorobutadiene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
isopropylbenzene	SW8260B	µg/L	**4.7**		[2.5, 2.5]	**4.1**		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
p-isopropyltoluene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
methyl tert-butyl ether (MTBE)	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
methylene chloride	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
naphthalene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	**1.2**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
n-propylbenzene	SW8260B	µg/L	**1.8 J**		[2.5, 2.5]	**1.7 J**		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]

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	Base	MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH		
	Site	Site 2			Site 2			Site 2			Site 2			Site 2			Site 2			Site 2			Site 2		
	Point	2-SP02			2-SP02			2-SP06			2-SP06			2-SP06			2-SP06			2-SP07			2-SP07		
	Sampling Date	09/29/2004 13:30			09/29/2004 13:30			07/01/2004 14:50			07/29/2004 12:40			08/24/2004 12:10			09/29/2004 11:25			07/01/2004 14:55			07/29/2004 12:35		
	Sample Depth	-			-			-			-			-			-			-			-		
	Sample Type	N1			FD1			N1			N1			N1			N1			N1			N1		
	Field Sample	2-SP2-WG031			2-SP2-WG032			2-SP6-WG023			2-SP6-WG024			2-SP6-WG025			2-SP6-WG026			2-SP7-WG027			2-SP7-WG028		
	Lab Sample	E4I300373-002			E4I300373-003			E4G020212-003			E4H020205-005			E4H250185-003			E4I300373-004			E4G020212-004			E4H020205-006		
	PVC / Run	PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1		
	Status	*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*		
Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
styrene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1,1,2-tetrachloroethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1,2,2-tetrachloroethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
tetrachloroethene (PCE)	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
toluene	SW8260B	µg/L	**80**		[2.5, 2.5]	**70**		[2.5, 2.5]	**0.44 J**		[1.0, 1]	**5.5**		[1.0, 1]	**29**		[1.0, 1]	**8.6**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2,3-trichlorobenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2,4-trichlorobenzene	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1,1-trichloroethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1,2-trichloroethane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
trichloroethene (TCE)	SW8260B	µg/L	**17**		[2.5, 2.5]	**17**		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	**1.6**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
trichlorofluoromethane	SW8260B	µg/L	ND		[5.0, 2.5]	ND		[5.0, 2.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
1,2,3-trichloropropane	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2,4-trimethylbenzene	SW8260B	µg/L	**1.9 J**		[2.5, 2.5]	**2.0 J**		[2.5, 2.5]	ND		[1.0, 1]	**0.32 J**		[1.0, 1]	**3.2**		[1.0, 1]	**0.45 J**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,3,5-trimethylbenzene	SW8260B	µg/L	**2.2 J**		[2.5, 2.5]	**2.2 J**		[2.5, 2.5]	ND		[1.0, 1]	**0.21 J**		[1.0, 1]	**2.0**		[1.0, 1]	**0.33 J**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
vinyl chloride	SW8260B	µg/L	ND		[2.5, 2.5]	ND		[2.5, 2.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
m- & p-xylene	SW8260B	µg/L	**110**		[2.5, 2.5]	**92**		[2.5, 2.5]	ND		[1.0, 1]	**6.2**		[1.0, 1]	**54**	**M**	[1.0, 1]	**5.8**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
o-xylene	SW8260B	µg/L	**38**		[2.5, 2.5]	**33**		[2.5, 2.5]	ND		[1.0, 1]	**3.5**		[1.0, 1]	**31**	**M**	[1.0, 1]	**3.6**		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]

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	Base		MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH		
	Site		Site 2			Site 2			Site 2			Site 2			Site 2			Site 2			Site 2		
	Point		2-SP07			2-SP07			2-SP08			2-SP08			2-SP08			2-SP08			2-SP08		
	Sampling Date		08/24/2004 12:15			09/29/2004 11:20			07/01/2004 13:50			07/01/2004 13:50			07/29/2004 11:35			08/24/2004 11:05			09/29/2004 11:35		
	Sample Depth		-			-			-			-			-			-			-		
	Sample Type		N1			N1			N1			FD1			N1			N1			N1		
	Field Sample		2-SP7-WG029			2-SP7-WG030			2-SP8-WG009			2-SP8-WG010			2-SP8-WG011			2-SP8-WG012			2-SP8-WG013		
	Lab Sample		E4H250185-004			E4I300373-005			E4G020212-005			E4G020212-006			E4H020205-007			E4H250185-005			E4I300373-006		
	PVC / Run		PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1		
	Status		*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*		
Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
benzene	SW8260B	µg/L	**1.4**		[1.0, 1]	ND		[1.0, 1]	**5800**		[500, 500]	**5800**		[500, 500]	**4200**		[250, 250]	**3800**		[250, 250]	**4300**		[250, 250]
bromobenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
bromochloromethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
bromodichloromethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
bromoform	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
bromomethane	SW8260B	µg/L	ND		[2.0, 1]	ND		[2.0, 1]	ND		[1000, 500]	ND		[1000, 500]	ND		[500, 250]	ND		[500, 250]	ND		[500, 250]
n-butylbenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
sec-butylbenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
tert-butylbenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
carbon tetrachloride	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
chlorobenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
chloroethane	SW8260B	µg/L	ND		[2.0, 1]	ND		[2.0, 1]	ND		[1000, 500]	ND		[1000, 500]	ND		[500, 250]	ND		[500, 250]	ND		[500, 250]
chloroform	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
chloromethane	SW8260B	µg/L	ND		[2.0, 1]	ND		[2.0, 1]	ND		[1000, 500]	ND		[1000, 500]	ND		[500, 250]	ND		[500, 250]	ND		[500, 250]
2-chlorotoluene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
4-chlorotoluene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,2-dibromo-3-chloropropane	SW8260B	µg/L	ND		[2.0, 1]	ND		[2.0, 1]	ND		[1000, 500]	ND		[1000, 500]	ND		[500, 250]	ND		[500, 250]	ND		[500, 250]
dibromochloromethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
dibromomethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,2-dichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,3-dichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,4-dichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
dichlorodifluoromethane	SW8260B	µg/L	ND		[2.0, 1]	ND		[2.0, 1]	ND		[1000, 500]	ND		[1000, 500]	ND		[500, 250]	ND		[500, 250]	ND		[500, 250]
1,1-dichloroethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,2-dichloroethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,1-dichloroethene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
cis-1,2-dichloroethene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
trans-1,2-dichloroethene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,2-dichloropropane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,3-dichloropropane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
2,2-dichloropropane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,1-dichloropropene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
cis-1,3-dichloropropene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
trans-1,3-dichloropropene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
ethylbenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	**610**		[500, 500]	**620**		[500, 500]	**490**		[250, 250]	**450**		[250, 250]	**520**		[250, 250]
ethylene dibromide (EDB)	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	**370 J**		[500, 500]	**340 J**		[500, 500]	**270**		[250, 250]	**240 J**		[250, 250]	**250**		[250, 250]
hexachlorobutadiene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
isopropylbenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
p-isopropyltoluene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
methyl tert-butyl ether (MTBE)	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
methylene chloride	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
naphthalene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
n-propylbenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]

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	Base		MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH		
	Site		Site 2			Site 2			Site 2			Site 2			Site 2			Site 2			Site 2		
	Point		2-SP07			2-SP07			2-SP08			2-SP08			2-SP08			2-SP08			2-SP08		
	Sampling Date		08/24/2004 12:15			09/29/2004 11:20			07/01/2004 13:50			07/01/2004 13:50			07/29/2004 11:35			08/24/2004 11:05			09/29/2004 11:35		
	Sample Depth		-			-			-			-			-			-			-		
	Sample Type		N1			N1			N1			FD1			N1			N1			N1		
	Field Sample		2-SP7-WG029			2-SP7-WG030			2-SP8-WG009			2-SP8-WG010			2-SP8-WG011			2-SP8-WG012			2-SP8-WG013		
	Lab Sample		E4H250185-004			E4I300373-005			E4G020212-005			E4G020212-006			E4H020205-007			E4H250185-005			E4I300373-006		
	PVC / Run		PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1		
	Status		*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*		
Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
styrene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,1,1,2-tetrachloroethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,1,2,2-tetrachloroethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
tetrachloroethene (PCE)	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
toluene	SW8260B	µg/L	**0.73 J**		[1.0, 1]	ND		[1.0, 1]	**20000**		[500, 500]	**20000**		[500, 500]	**17000**		[250, 250]	**15000**		[250, 250]	**16000**		[250, 250]
1,2,3-trichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,2,4-trichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,1,1-trichloroethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,1,2-trichloroethane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
trichloroethene (TCE)	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
trichlorofluoromethane	SW8260B	µg/L	ND		[2.0, 1]	ND		[2.0, 1]	ND		[1000, 500]	ND		[1000, 500]	ND		[500, 250]	ND		[500, 250]	ND		[500, 250]
1,2,3-trichloropropane	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,2,4-trimethylbenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
1,3,5-trimethylbenzene	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
vinyl chloride	SW8260B	µg/L	ND		[1.0, 1]	ND		[1.0, 1]	ND		[500, 500]	ND		[500, 500]	ND		[250, 250]	ND		[250, 250]	ND		[250, 250]
m- & p-xylene	SW8260B	µg/L	**1.3**		[1.0, 1]	ND		[1.0, 1]	**2400**		[500, 500]	**2500**		[500, 500]	**2200**		[250, 250]	**2000**		[250, 250]	**2200**		[250, 250]
o-xylene	SW8260B	µg/L	**0.93 J**		[1.0, 1]	ND		[1.0, 1]	**990**		[500, 500]	**1000**		[500, 500]	**850**		[250, 250]	**790**		[250, 250]	**820**		[250, 250]

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	Base		MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH		
	Site		Site 2			Site 2			Site 2			Site 2			Site 2			NA			NA			NA		
	Point		2-SP09			2-SP09			2-SP09			2-SP09			2-SP09			FIELDQC			FIELDQC			FIELDQC		
	Sampling Date		07/01/2004 13:35			07/29/2004 12:00			08/24/2004 11:30			08/24/2004 11:30			09/29/2004 12:05			07/01/2004			07/29/2004			08/24/2004		
	Sample Depth		-			-			-			-			-			-			-			-		
	Sample Type		N1			N1			N1			FD1			N1			TB1			TB1			TB1		
	Field Sample		2-SP9-WG009			2-SP9-WG010			2-SP9-WG011			2-SP9-WG012			2-SP9-WG013			2-TB-WG032			2-TB-WG033			2-TB-WG034		
	Lab Sample		E4G020212-007			E4H020205-008			E4H250185-006			E4H250185-007			E4I300373-007			E4G020212-008			E4H020205-009			E4H250185-008		
	PVC / Run		PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1		
	Status		*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*		
Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
benzene	SW8260B	µg/L	**1600**		[33, 33.33]	**760**		[10, 10]	**600**		[10, 10]	**630**		[10, 10]	**590**		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromobenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromochloromethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromodichloromethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromoform	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
bromomethane	SW8260B	µg/L	ND		[67, 33.33]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
n-butylbenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
sec-butylbenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
tert-butylbenzene	SW8260B	µg/L	ND		[33, 33.33]	**2.7 J**		[10, 10]	**2.4 J**		[10, 10]	**2.5 J**		[10, 10]	**2.9 J**		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
carbon tetrachloride	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
chlorobenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
chloroethane	SW8260B	µg/L	ND		[67, 33.33]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
chloroform	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
chloromethane	SW8260B	µg/L	ND		[67, 33.33]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
2-chlorotoluene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
4-chlorotoluene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2-dibromo-3-chloropropane	SW8260B	µg/L	ND		[67, 33.33]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
dibromochloromethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
dibromomethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2-dichlorobenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,3-dichlorobenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,4-dichlorobenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
dichlorodifluoromethane	SW8260B	µg/L	ND		[67, 33.33]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
1,1-dichloroethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2-dichloroethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1-dichloroethene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
cis-1,2-dichloroethene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
trans-1,2-dichloroethene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2-dichloropropane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,3-dichloropropane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
2,2-dichloropropane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1-dichloropropene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
cis-1,3-dichloropropene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
trans-1,3-dichloropropene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
ethylbenzene	SW8260B	µg/L	**220**		[33, 33.33]	**42**		[10, 10]	**40**		[10, 10]	**43**		[10, 10]	**38**		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
ethylene dibromide (EDB)	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
hexachlorobutadiene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
isopropylbenzene	SW8260B	µg/L	**260**		[33, 33.33]	**56**		[10, 10]	**53**		[10, 10]	**56**		[10, 10]	**50**		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
p-isopropyltoluene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
methyl tert-butyl ether (MTBE)	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
methylene chloride	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
naphthalene	SW8260B	µg/L	ND		[33, 33.33]	**5.1 J**		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
n-propylbenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]

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	Base		MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH			MARCH		
	Site		Site 2			Site 2			Site 2			Site 2			Site 2			NA			NA			NA		
	Point		2-SP09			2-SP09			2-SP09			2-SP09			2-SP09			FIELDQC			FIELDQC			FIELDQC		
	Sampling Date		07/01/2004 13:35			07/29/2004 12:00			08/24/2004 11:30			08/24/2004 11:30			09/29/2004 12:05			07/01/2004			07/29/2004			08/24/2004		
	Sample Depth		-			-			-			-			-			-			-			-		
	Sample Type		N1			N1			N1			FD1			N1			TB1			TB1			TB1		
	Field Sample		2-SP9-WG009			2-SP9-WG010			2-SP9-WG011			2-SP9-WG012			2-SP9-WG013			2-TB-WG032			2-TB-WG033			2-TB-WG034		
	Lab Sample		E4G020212-007			E4H020205-008			E4H250185-006			E4H250185-007			E4I300373-007			E4G020212-008			E4H020205-009			E4H250185-008		
	PVC / Run		PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1			PR / 1		
	Status		*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*			*Validated*		
Analyte	Method	Unit	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]	Result	QA	[RL, DF]
styrene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1,1,2-tetrachloroethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1,2,2-tetrachloroethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
tetrachloroethene (PCE)	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
toluene	SW8260B	µg/L	**780**		[33, 33.33]	**440**		[10, 10]	**420**		[10, 10]	**430**		[10, 10]	**360**		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2,3-trichlorobenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2,4-trichlorobenzene	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1,1-trichloroethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,1,2-trichloroethane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
trichloroethene (TCE)	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
trichlorofluoromethane	SW8260B	µg/L	ND		[67, 33.33]	ND		[20, 10]	ND		[20, 10]	ND		[20, 10]	ND		[25, 12.5]	ND		[2.0, 1]	ND		[2.0, 1]	ND		[2.0, 1]
1,2,3-trichloropropane	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,2,4-trimethylbenzene	SW8260B	µg/L	**35**		[33, 33.33]	**23**		[10, 10]	**21**		[10, 10]	**22**		[10, 10]	**23**		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
1,3,5-trimethylbenzene	SW8260B	µg/L	ND		[33, 33.33]	**9.2 J**		[10, 10]	**8.5 J**		[10, 10]	**8.9 J**		[10, 10]	**9.1 J**		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
vinyl chloride	SW8260B	µg/L	ND		[33, 33.33]	ND		[10, 10]	ND		[10, 10]	ND		[10, 10]	ND		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
m- & p-xylene	SW8260B	µg/L	**560**		[33, 33.33]	**300**		[10, 10]	**240**		[10, 10]	**250**		[10, 10]	**240**		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]
o-xylene	SW8260B	µg/L	**190**		[33, 33.33]	**120**		[10, 10]	**110**		[10, 10]	**110**		[10, 10]	**99**		[12, 12.5]	ND		[1.0, 1]	ND		[1.0, 1]	ND		[1.0, 1]

FINAL DATA - PRINTED 02/16/2005
(Page 9 of 10)

Base	MARCH
Site	NA
Point	FIELDQC
Sampling Date	09/29/2004
Sample Depth	-
Sample Type	TB1
Field Sample	2-TB-WG035
Lab Sample	E4I300373-008
PVC / Run	PR / 1
Status	*Validated*

Analyte	Method	Unit	Result	QA	[RL, DF]
benzene	SW8260B	µg/L	ND		[1.0, 1]
bromobenzene	SW8260B	µg/L	ND		[1.0, 1]
bromochloromethane	SW8260B	µg/L	ND		[1.0, 1]
bromodichloromethane	SW8260B	µg/L	ND		[1.0, 1]
bromoform	SW8260B	µg/L	ND		[1.0, 1]
bromomethane	SW8260B	µg/L	ND		[2.0, 1]
n-butylbenzene	SW8260B	µg/L	ND		[1.0, 1]
sec-butylbenzene	SW8260B	µg/L	ND		[1.0, 1]
tert-butylbenzene	SW8260B	µg/L	ND		[1.0, 1]
carbon tetrachloride	SW8260B	µg/L	ND		[1.0, 1]
chlorobenzene	SW8260B	µg/L	ND		[1.0, 1]
chloroethane	SW8260B	µg/L	ND		[2.0, 1]
chloroform	SW8260B	µg/L	ND		[1.0, 1]
chloromethane	SW8260B	µg/L	**0.52 J**		[2.0, 1]
2-chlorotoluene	SW8260B	µg/L	ND		[1.0, 1]
4-chlorotoluene	SW8260B	µg/L	ND		[1.0, 1]
1,2-dibromo-3-chloropropane	SW8260B	µg/L	ND		[2.0, 1]
dibromochloromethane	SW8260B	µg/L	ND		[1.0, 1]
dibromomethane	SW8260B	µg/L	ND		[1.0, 1]
1,2-dichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]
1,3-dichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]
1,4-dichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]
dichlorodifluoromethane	SW8260B	µg/L	ND		[2.0, 1]
1,1-dichloroethane	SW8260B	µg/L	ND		[1.0, 1]
1,2-dichloroethane	SW8260B	µg/L	ND		[1.0, 1]
1,1-dichloroethene	SW8260B	µg/L	ND		[1.0, 1]
cis-1,2-dichloroethene	SW8260B	µg/L	ND		[1.0, 1]
trans-1,2-dichloroethene	SW8260B	µg/L	ND		[1.0, 1]
1,2-dichloropropane	SW8260B	µg/L	ND		[1.0, 1]
1,3-dichloropropane	SW8260B	µg/L	ND		[1.0, 1]
2,2-dichloropropane	SW8260B	µg/L	ND		[1.0, 1]
1,1-dichloropropene	SW8260B	µg/L	ND		[1.0, 1]
cis-1,3-dichloropropene	SW8260B	µg/L	ND		[1.0, 1]
trans-1,3-dichloropropene	SW8260B	µg/L	ND		[1.0, 1]
ethylbenzene	SW8260B	µg/L	ND		[1.0, 1]
ethylene dibromide (EDB)	SW8260B	µg/L	ND		[1.0, 1]
hexachlorobutadiene	SW8260B	µg/L	ND		[1.0, 1]
isopropylbenzene	SW8260B	µg/L	ND		[1.0, 1]
p-isopropyltoluene	SW8260B	µg/L	ND		[1.0, 1]
methyl tert-butyl ether (MTBE)	SW8260B	µg/L	ND		[1.0, 1]
methylene chloride	SW8260B	µg/L	ND		[1.0, 1]
naphthalene	SW8260B	µg/L	ND		[1.0, 1]
n-propylbenzene	SW8260B	µg/L	ND		[1.0, 1]

FINAL DATA - PRINTED 02/16/2005
(Page 10 of 10)

Base	MARCH	
Site	NA	
Point	FIELDQC	
Sampling Date	09/29/2004	
Sample Depth	-	
Sample Type	TB1	
Field Sample	2-TB-WG035	
Lab Sample	E4I300373-008	
PVC / Run	PR / 1	
Status	*Validated*	

Analyte	Method	Unit	Result	QA	[RL, DF]
styrene	SW8260B	µg/L	ND		[1.0, 1]
1,1,1,2-tetrachloroethane	SW8260B	µg/L	ND		[1.0, 1]
1,1,2,2-tetrachloroethane	SW8260B	µg/L	ND		[1.0, 1]
tetrachloroethene (PCE)	SW8260B	µg/L	ND		[1.0, 1]
toluene	SW8260B	µg/L	ND		[1.0, 1]
1,2,3-trichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]
1,2,4-trichlorobenzene	SW8260B	µg/L	ND		[1.0, 1]
1,1,1-trichloroethane	SW8260B	µg/L	ND		[1.0, 1]
1,1,2-trichloroethane	SW8260B	µg/L	ND		[1.0, 1]
trichloroethene (TCE)	SW8260B	µg/L	ND		[1.0, 1]
trichlorofluoromethane	SW8260B	µg/L	ND		[2.0, 1]
1,2,3-trichloropropane	SW8260B	µg/L	ND		[1.0, 1]
1,2,4-trimethylbenzene	SW8260B	µg/L	ND		[1.0, 1]
1,3,5-trimethylbenzene	SW8260B	µg/L	ND		[1.0, 1]
vinyl chloride	SW8260B	µg/L	ND		[1.0, 1]
m- & p-xylene	SW8260B	µg/L	ND		[1.0, 1]
o-xylene	SW8260B	µg/L	ND		[1.0, 1]

Appendix B
Data Validation Reports

MEMORANDUM

Date: August 2, 2004

To: Bill Muir

From: Elisabeth Fruth

Subject: March ARB, CA, - Site 2 – Laboratory Reports – July 1, 2004 Sampling

Guidance Documents: Final Work Plan and Quality Project Plan for the Basewide Remedial Investigation/Feasibility Study, March ARB, CA (Earth Tech March 1999) and Variances to the March ARB Basewide Plan

We have reviewed the following report from STL Los Angeles for the March ARB project: E4G020212 (water).

Duplicate agreement was excellent for all methods.

No qualifiers were assigned to the samples.

Note: Several samples had one VOA vial with bubbles larger than 5 mm upon receipt at the laboratory. Two vials for the trip blank were affected. None of these vials were used for the analysis of the samples.

MEMORANDUM

Date: September 14, 2004

To: Bill Muir

From: Elisabeth Fruth

Subject: March ARB, CA, - Site 2 – Laboratory Reports – July 29, 2004 Sampling

Guidance Documents: Final Work Plan and Quality Project Plan for the Basewide Remedial Investigation/Feasibility Study, March ARB, CA (Earth Tech March 1999) and Variances to the March ARB Basewide Plan

We have reviewed the following reports from STL Los Angeles for the March ARB project: E4H020205 (water), E4G300278 and E4H030308 (air). E4H020205 was a full raw data package.

Duplicate agreement was acceptable for all methods.

No qualifiers were assigned to the samples.

E4G300278

1. The method blank had a trace amount of xylenes, but the sample was nondetect for this analyte.

E4H020205

1. Sample -01 was a PE sample for gasoline and diesel by Method 8015B. Results reported were within the range for the value certified by ERA. Raw data was reviewed.
2. Samples -02 and -03 had one VOA vial with bubbles larger than 5 mm upon receipt at the laboratory. Two vials for samples -04 and -08 were affected. Except for sample -03, these vials were used for the analysis of the samples.
3. Method 8260: Although the vial analyzed for sample -02 had a bubble >5mm at receipt, and the vial analyzed for its duplicate (sample -03) did not have any bubble upon receipt, the duplicate agreement is very good except for ethylbenzene. The duplicate result is higher for this analyte, but the RPD is still less than 30 percent, and therefore acceptable. Therefore it seem reasonable to assume that the presence of bubbles does not have a major impact on the data.

MEMORANDUM

Date: September 20, 2004

To: Bill Muir

From: Elisabeth Fruth

Subject: March ARB, CA, - Site 2 – Laboratory Reports – August 24, 2004 Sampling

Guidance Documents: Final Work Plan and Quality Project Plan for the Basewide Remedial Investigation/Feasibility Study, March ARB, CA (Earth Tech March 1999) and Variances to the March ARB Basewide Plan

We have reviewed the following reports from STL Los Angeles for the March ARB project: E4H250185 (water), E4H250196 and E4H260378 (air).

Duplicate agreement was very good for all methods.

Qualifiers were assigned to the samples as listed below.

E4H250185

1. No headspace was noted in the VOA vials upon receipt.
2. Method 8260: The recoveries in the MS/MSD for the spiked analytes o-xylene and m,p-xylene were below the unspiked sample results. The unspiked sample results were fairly high, but not more than 4 times the spike level. The unspiked sample result for benzene was more than 4 times the spike level and therefore the recovery is not calculated. Qualify o-xylene and m,p-xylene in sample -003 (MARCH-2-SP6-WG025) "M" for matrix effect, although the problem probably is not a true matrix effect but rather a consequence of inhomogeneity in the sample aliquots (different VOA vials).

September 14, 2004

STL Los Angeles
1721 S. Grand Ave.
Santa Ana, CA 92705

Attn. Sabina Sudoko/Linda Scharpenberg
Subject: March ARB - PE Sample

Dear Linda,

A Performance Evaluation (PE) sample was submitted to STL Los Angeles on July 29, 2004 with a shipment of samples from March ARB, Site 2. The laboratory sample ID is E4H020205-01 (2-SP10-WG002). The sample was analyzed for gasoline by Method 8015B and diesel by Method 8015B.

Both analytes were correctly identified (i.e., detected compound reported as diesel or gasoline, respectively) and quantified within the ERA criteria.

Per our requirements, the laboratory achieved 100 percent completeness for both the extractables by Method 8015B and the purgeables by Method 8015B.

Attached are the reported results for these samples along with a copy of the certified values by ERA.

Very truly yours,

Earth Tech

Elisabeth Fruth
QA Manager

cc. Alain Sharp - ET
Bill Muir -ET
Brent Adair - ET
Paul Peterson – ET
Wen Huang

MEMORANDUM

Date: December 8, 2004

To: Bill Muir

From: Elisabeth Fruth

Subject: March ARB, CA, - Site 2 – Laboratory Reports – September 29, 2004 Sampling

Guidance Documents: Final Work Plan and Quality Project Plan for the Basewide Remedial Investigation/Feasibility Study, March ARB, CA (Earth Tech March 1999) and Variances to the March ARB Basewide Plan

We have reviewed the following reports from STL Los Angeles for the March ARB project: E4I300373 (water), E4I300284 and E4J020153 (air).

Duplicate agreement was very good for all methods.

Qualifiers were assigned to the samples as listed below.

E4I300373

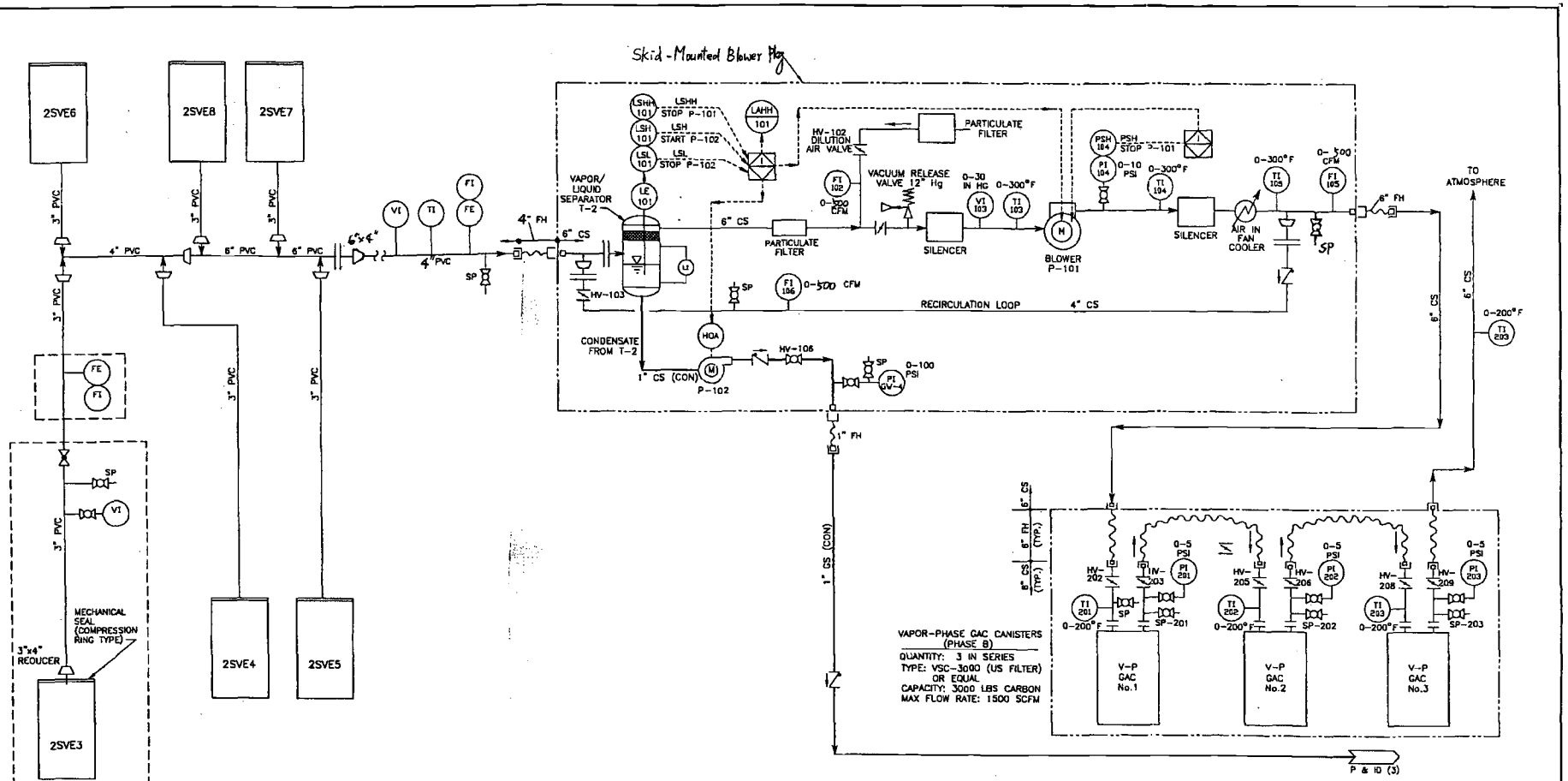
1. Headspace <5mm was noted in the VOA vials upon receipt.
2. Method 8260: The RSD for naphthalene in the initial calibration was above 30%; however, the coefficient of determination (linear regression) was acceptable. No qualifiers are assigned.
3. Method 8015B for gasoline: Errors in the reported results have been corrected by the laboratory.

E4I300284

1. Method TO-3: The sample was analyzed 6.5 hours past the 72-hour holding time. Results for this sample are qualified as rejected, "R".

Appendix C
Manufacturer's Cut-Sheets and Component Specifications

SVE/GAC System Piping and Instrumentation Drawing



(TYP. FOR 2SVE3, 2SVE4, 2SVE5, 2SVE6, 2SVE7, 2SVE8)

VAPOR-PHASE GAC CANISTERS (PHASE II)
QUANTITY: 3 IN SERIES
TYPE: VSC-3000 (US FILTER) OR EQUAL
CAPACITY: 3000 LBS CARBON
MAX FLOW RATE: 1500 SCFM

SVE SYSTEM, SITE 2

REVISION	DATE	DESCRIPTION	BY
DESIGNED	R. Lindfors	DEPARTMENT OF THE AIR FORCE HQ AIR FORCE RESERVE COMMAND ROBINS AFB, GEORGIA	
DRAWN	J. Young	MARCH AIR RESERVE BASE	CALIFORNIA
CHECKED		SUBSURFACE REMEDIATION SYSTEM SITE 2	
SUBMITTED		P & ID (1)	
DATE APPROVED		SCALE	SPEC. No.:
		SHEET 15 OF 16	FILE No.:

JOB No. K:\PROJECTS\MARCH\618627\FINAL\PID1.DWG REV. 10/23/01 PLOT 1=2 MARCH.PCP

SVE/GAC System Equipment Manuals

TECHNICAL PROPOSAL | OMEGA | More air flow With less energy | **KAESER OMEGA BLOWERS**

Customer: Earth Tech
Location: March air
Project: March Air

Distributor: Onilon
Date: 05/07/04

KAESER
Omega-pak Model DB 130 vac
Rotary Blower Package

Vacuum application Standard package

For an oil-free conveying medium

Available with CE Manufacturer's Declaration within the meaning of Machinery Directive 98/37 EG, a. II B

Gas handled:		dry air	
Inlet flow at design conditions:		341	icfm
Inlet flow at standard conditions: Standard conditions 14.7 psia, 68 °F and 36% RH		250	scfm
Blower speed at design conditions:		3500	rpm
Design conditions:			
Inlet pressure (absolute)		10.8	psia
Inlet temperature		68	°F
Pressure difference	7.94 "Hg	3.9	psi
Discharge pressure (absolute)		14.7	psia
Discharge temperature		129	°F
Blower shaft power		7.0	bhp
Motor rated power		10.0	hp
Motor enclosure		TEFC	
Motor voltage / frequency		230V/ 60Hz	
Type of cooling		Air cooled	
Connection size		3"	

	without enclosure	with enclosure
Estimted noise level to PN 8 NTC 2.3 at 1 meter, free field measurement with sound insulated piping	86 dB(A)	71 dB(A)
Dimension (L x W x H)	35x 21 x 42 inches	56x 45 x 54 inches
Estimated Weight	ca. 474 lbs	ca. 785 lbs

Attention OMEGA 23, 43 and 63 model blowers can be run over 12 psig, but requires factory APPROVAL, a limited warranty may apply.

V 7.0 AD VERSION 03/20/02

Kaeser Compressors, Inc.
P.O. Box 946
Fredericksburg, VA 22408
Tel.: (540) 898-5500 Fax.: -5520

SERVICE MANUAL USE

Rotary Blower

Model: OMEGA 41

Part No.: 881001.01100

Serial No.: .....

Index: 010321

Table of Contents

KAESER COMPRESSORS

Table of Contents

KAESER COMPRESSORS

1 Technical Specification

1.1 Rotary Blower

Model		OMEGA 41 881001.01100
Configuration		vertical or horizontal *
Direction of rotation		cw or ccw*
Flow at maximum speed and maximum pressure	388	CFM
The effective volume flow is dependent on the speed and the relative pressure.		
Power consumption** (at maximum speed and maximum differential pressure)	44.6	BHP
Maximum radial loading of the shaft (e.g. belt tension)	674	lbf
Maximum operating speed of the rotors	4400	rpm
Maximum operating gauge pressure	15	psig
Maximum pressure difference Δp in pressure operation discharge pressure – inlet pressure	15	psid
Maximum pressure difference Δp in vacuum operation discharge pressure – inlet pressure	15	inch Hg
Maximum pressure ratio discharge pressure to inlet pressure	2:1	
Maximum discharge temperature	320	°F
Maximum temperature rise inlet temperature –discharge temperature	207	°F
Flange connection: inlet port/discharge port	3"	NPT
Weight	201	lbs

* The configuration and direction of rotation can be selected by the user according to installation requirements. Configuration: Horizontal.
It is necessary to modify the block for vertical direction of flow (see chapter 6.1).

** The power consumption is dependent on the operating point required, e.g. volume flow, differential pressure.

1.2 Installation Requirements

Minimum ambient temperature*	5	°F
Maximum ambient temperature*	140	°F

* These temperature limits determine the lubricant required according to application (see lubricant recommendations for further details).

1.3 Lubricating Oil Capacities

Configuration	Drive end	Gear end
vertical	6.1 oz	6.7 oz
horizontal	11.2 oz	11.8 oz

1.4 Recommended Lubricant

Use the following lubricant depending on ambient temperature and the expected oil temperature.

Temperature	Recommended lubricant	ISO Viscosity Grade
Ambient temperature: 25°F to 140°F Oil temperature: up to 250°F	OMEGA SB-220*	220
Ambient temperature: 5°F to 105°F Oil temperature: 25°F to 140°F	SHELL Morlina 100 (Mineral Lubricant)	100
Ambient temperature: 25°F to 140°F Oil temperature: 35°F to 230°F	SHELL Morlina 220 (Mineral Lubricant)	220

* Synthetic lubricant specially formulated for rotary lobe blowers.

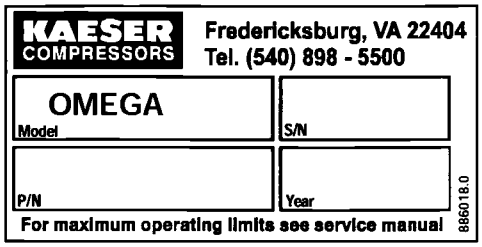
Attention! **The rotary blower is filled at the factory for horizontal configuration. The vertical configuration requires more lubricant (see chapter 1.3)**

Type of lubricant used: SHELL Morlina 220.

Consult factory for other viscosity grades for special applications.

1.5 Designation

The name plate of the rotary blower is located on the bearing case (gear end).



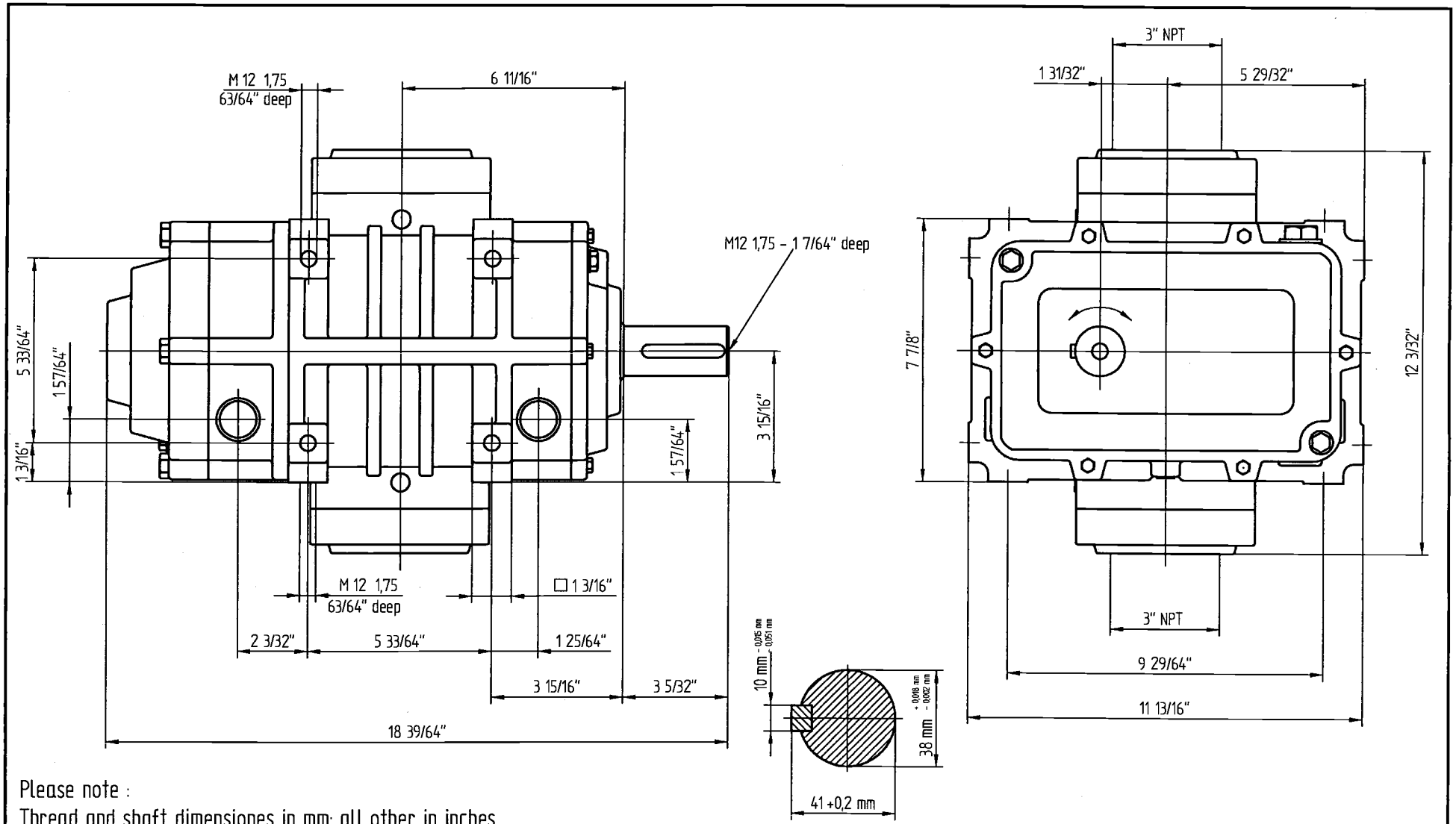
1.6 Dimensional Drawing

See following page: Drawing-No. 881001.01100

1.7 Performance curves

Pressure curve see following page: Info Version 2.0

Vacuum curve see following page: Info Version 2.0



Please note :
Thread and shaft dimensiones in mm; all other in inches

Blower must be mounted on a completely flat surface
Permisible flatness : 0,002"

OMEGA 41			881001.01100
Stand: 28.09.99	Datum: 28.09.99	Name: Heckner	CAD-Datei: MB000512.dft

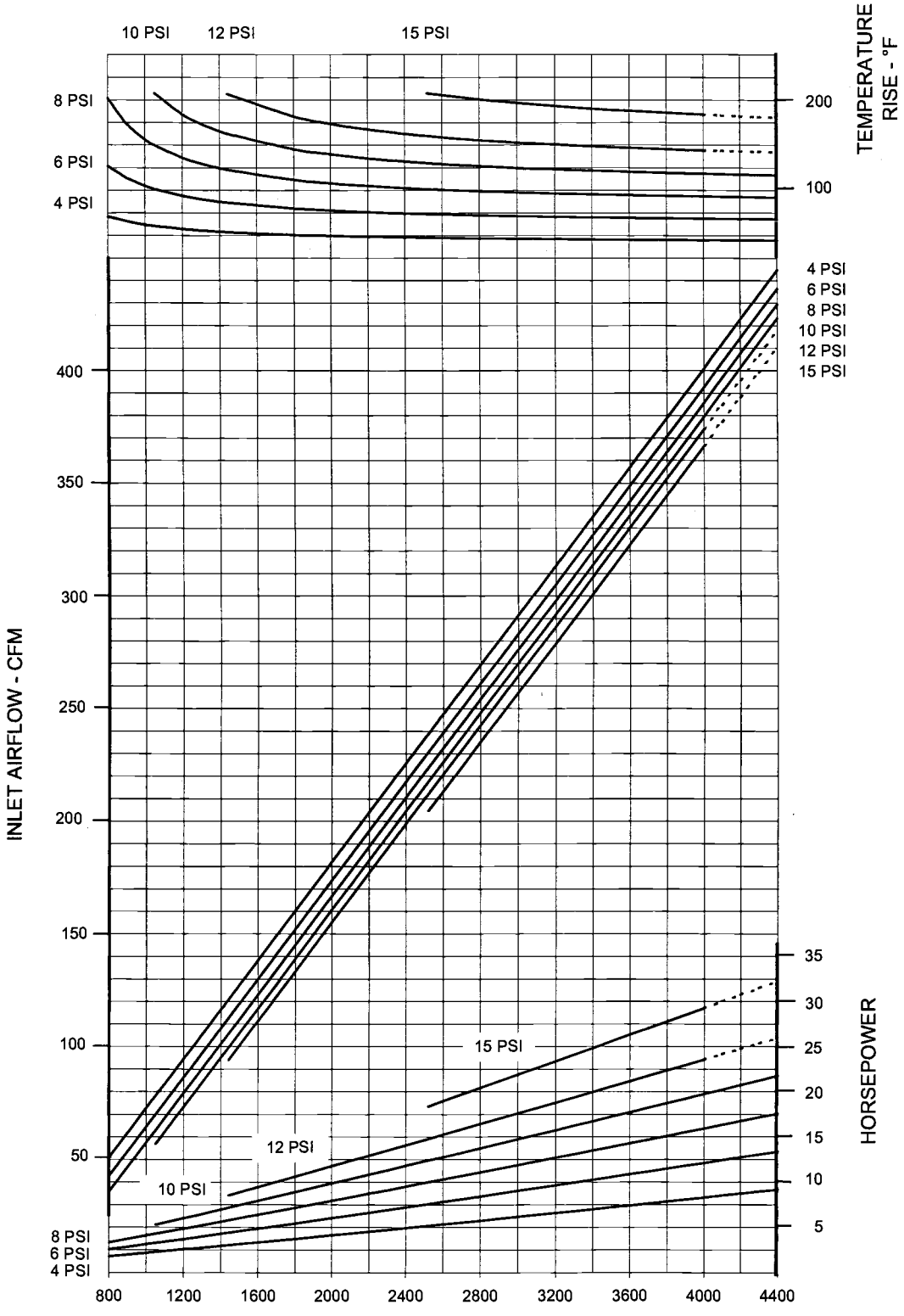
KAESER COMPRESSORS

KAESER COMPRESSORS

OMEGA 41

Date: 06-02-98
Page: 1 of 1

PRESSURE PERFORMANCE
14,7 PSIA and 68° F



over 10 PSI factory approval required
if near to max. speed and belt drive

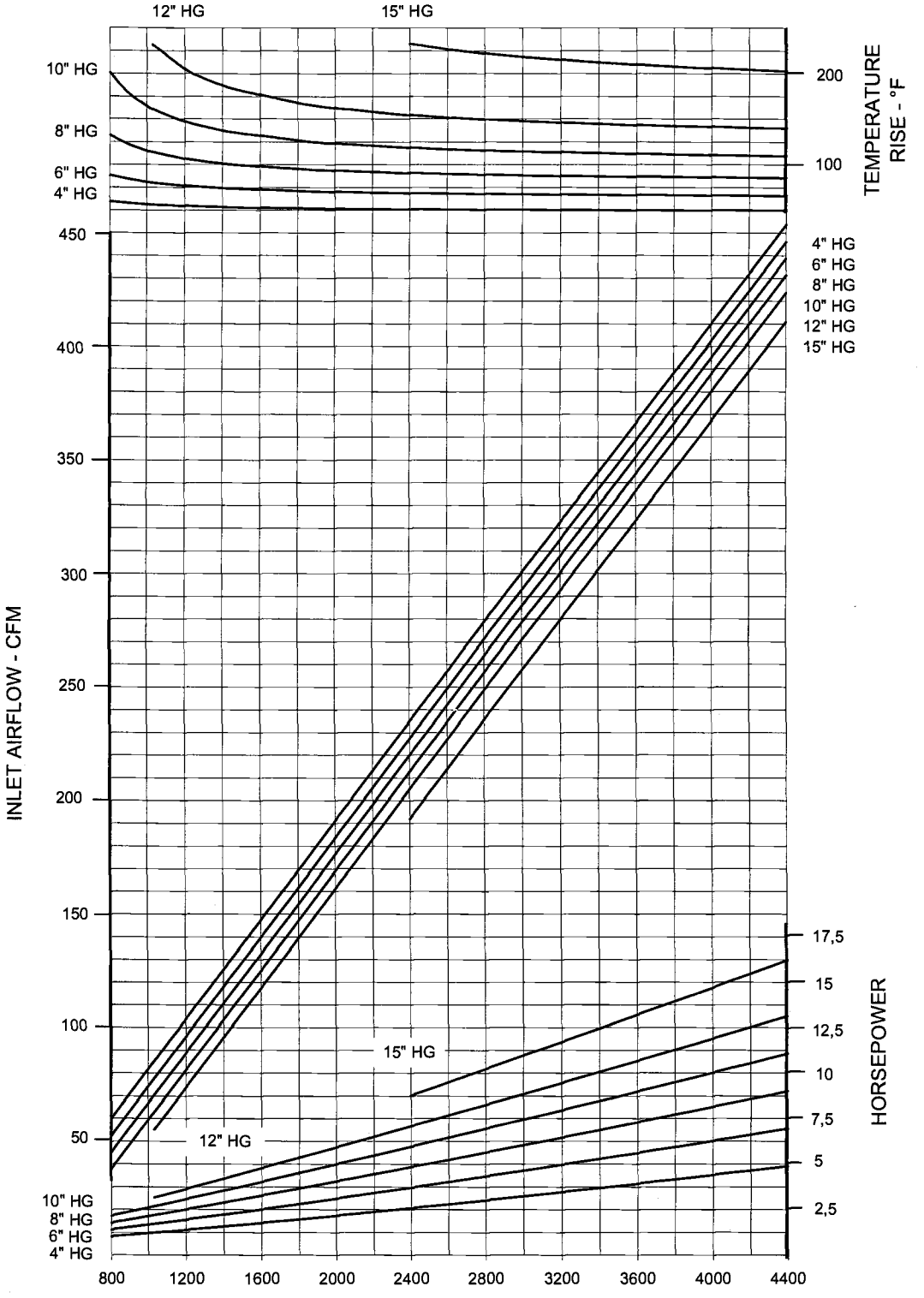
Version: 2.0

KAESER COMPRESSORS

OMEGA 41

Date: 06-02-98
Page: 1 of 1

VACUUM PERFORMANCE
14,7 PSIA and 68° F



Version: 2.0

2 Safety Regulations

Read this service manual carefully and observe all cautionary references before putting the rotary blower into operation and before carrying out any maintenance.

2.1 Explanation of Symbols and References

This symbol is placed before all references to safety where danger to life and limb can occur during work. It is especially important that these rules are observed and that extreme care is taken in these cases. For their own protection, inform all other users of these safety rules. Observe general safety and accident prevention regulations as well as the safety rules laid down in this service manual.

Attention! **This symbol is placed at points where considerable attention must be paid to recommendations, regulations, references and correct sequence so that damage and/or destruction of the rotary blower and/or other equipment is prevented.**

This symbol identifies environmental protection measures.

☞ **This symbol indicates operations to be carried out by the operator or service technician.**

• **This bullet identifies listings.**

Explanation of the warning notice on the rotary blower:

Warning:
Hot surface, do not touch.

2.2 Accident Prevention Regulations

No open flame and flying sparks at the place of installation.

During any welding work necessary on the rotary blower or nearby e sure that sparks or high temperatures cannot cause fire or explosion.

Operating personnel must be instructed on the necessity of wearing ear muffs during operation of the rotary blower, especially during operation without the acoustic hood.

Do not linger for long periods in the direct vicinity of rotary blowers with damaging noise levels.

Do not use rotary blowers for explosive or damaging gases.

Because of the high temperatures generated (up to 300 °F), do not touch pipes or ancillaries during operation of the rotary blower. Wait until the blower has cooled down and pressure is vented before carrying out repairs to pipework.

Use only the lubricants recommended by the manufacturer.

2.3 General References

Attention!

The rotary blower is not capable of independent function and is designed as a built – in unit or as a unit complementary to another machine.

The rotary blower may only be put into operation as an integral part of the complete machine and then only after the complete machine was subjected to a safety inspection proving that it conforms to the requirements of the accident prevention regulations (see OSHA CFR 29 § 1910), e.g. protective guards at sources of danger such as noise, high temperature, etc.

Work on power driven systems may be carried out by trained or specialised personnel only.

Attention!

The warranty is invalidated if modifications are carried out without previous consultation with and the consent of KAESER COMPRESSORS, INC.

2.4 Spare Parts

Safe and reliable rotary blower operation is guaranteed only with original KAESER spare parts.

3 General

3.1 Correct Use

Attention!

The rotary blower package is intended solely for the transport of oil-free air or any inert gas without any liquids or solids and in conformity with the technical specification (see chapter 1.1).

For special gas applications contact KAESER COMPRESSORS, INC.

Do not use this blower for any combustible gas applications.

Any other use is considered incorrect. The manufacturer cannot accept liability for any damage caused by incorrect use. The user alone is liable for any risks incurred. Correct use also means compliance with the installation, removal, commissioning, operational and maintenance instructions laid down by the manufacturer.

This service manual is intended for operating, maintenance and supervisory personnel use only.

3.2 Copyright

4 Transport

4.1 Transport Instructions

To avoid damage to the rotary blower we recommend the use of a fork lift truck, lift truck or a sling for transporting the rotary blower.

See chapter 1.1 for the weight.

4.2 Transport with a Fork Lift Truck or Lift Truck

Always place the rotary blower on a suitable transporting medium (e.g. pallet) when transporting with a fork lift truck or lift truck.

Attention! **Never drive directly underneath and lift the rotary blower with the bare forks.**

4.3 Transport with a Crane Hook

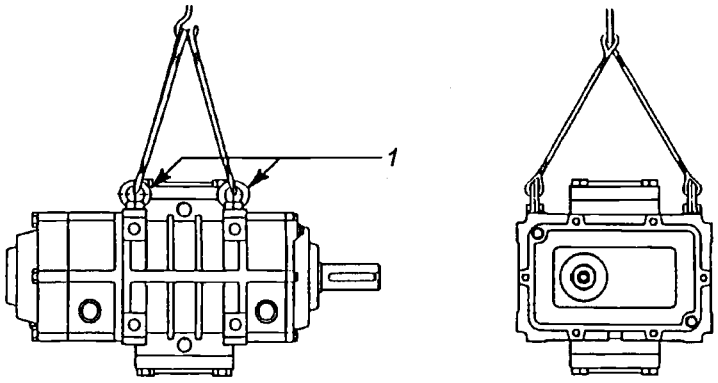
Attention! **When transporting the rotary blower with a crane all standard regulations regarding this type of operation must be complied with.**

Do not stand below a hanging load.

Do not exceed the maximum permissible lifting weight specified for the lifting appliance.

When lifting the rotary blower with a crane hook and slings use the two eyebolts provided. Screw these eyebolts into the threaded holes in the upper mounting faces at a slant from corner to corner.

Attention! **Take care that the eyebolts are screwed fully into the block. Avoid sudden, sharp vertical movements when lifting, lowering and transporting the rotary blower.**



1 Eyebolts

4.4 Temporary Storage

Attention! **Store the rotary blower in a dry, enclosed space. Leave the flanged ports blanked off to prevent contamination.**

Temporary storage for longer than one year:

- ☞ Spray preserving oil onto the flanged ports, drive shaft, air chamber and any other base metal to protect against corrosion. Blank off the flanged ports again.
- ☞ Carry out an oil change annually (see chapter 9.4).

Recommended preserving oil:

External:

EXXON RUST BAN 326

MOBIL Mobilarma 777 or 778

SHELL V-Product 9703

Internal:

MOBIL Mobilarma 523 or 524

SHELL RIMULA 30 or ROTELLA T 20W20

or similar makes.

Putting into operation after a long period of temporary storage:

- ☞ Remove the preserving material from the air chamber with a suitable solvent.
- ☞ Carry out the measures detailed for installation and putting into operation.
- ☞ Carry out an oil change (see chapter 9.4).

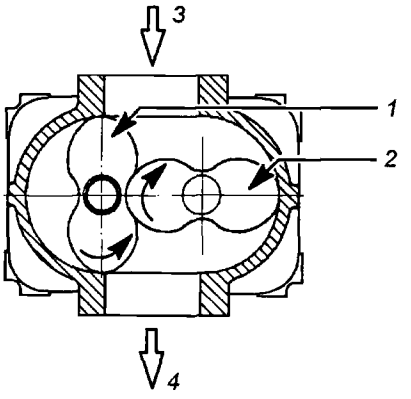
5 Construction and Principle of Operation

5.1 Construction

Two rotors, synchronised by a pair of timing gears, rotate in opposite directions in two cylindrical bores within a housing. A defined quantity of air entering the inlet port is trapped between the rotors and the housing and carried round to the discharge port.

Because there is no contact between the rotors rotate and the housing there is no wear and no lubrication is required.

The integrated feet on all sides oft the housing allow a universal installation; standing, lying mounted at the sides, mounted on or under.



1 Male rotor
2 Female rotor
3 Inlet port
4 Discharge port

5.2 Configuration

KAESER rotary blower are delivered in the „horizontal flow configuration".

See chapter 6.1 for other configurations.

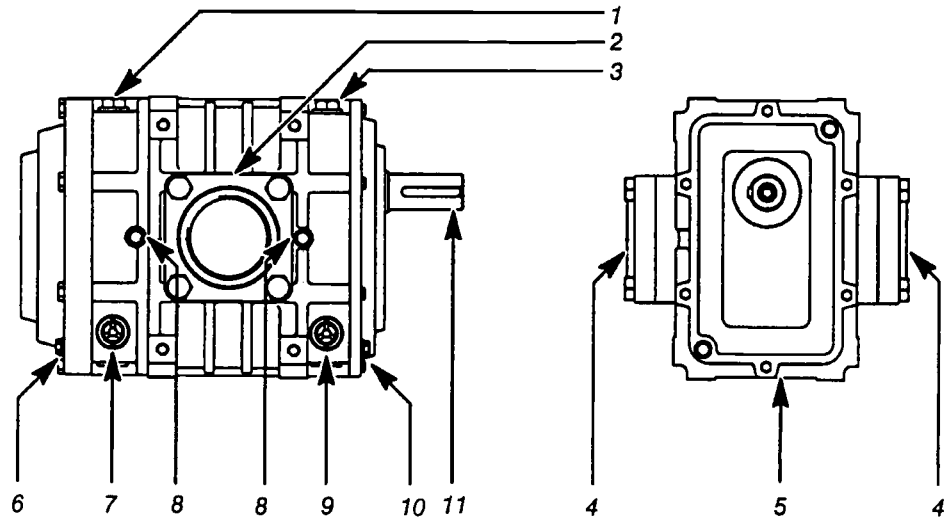
5.2.1 Vertical flow configuration

- The drive shaft (11) is located at the upper rotor.

Attention! **In the vertical flow configuration the rotary blower may only be operated with the drive shaft located at the upper rotor.**

If it is required to locate the drive shaft at the lower rotor in vertical configuration, KAESER COMPRESSORS, INC. must be consulted first.

- See the following diagramm for the positions of the oil level sight glasses (7) / (9) and oil filler plugs (1) / (3).
- The gas vents (5) are open.
- The gas vents (8) for vertical flow configuration are closed.
- See chapter 1.3 for oil capacities.



1 Oil filler, gear end
2 Test gauge plug
3 Oil filler plug, drive end
4 Flange adapter
5 Gas vent opening (open)
6 Oil drain, gear end
7 Oil level sight glass, gear end
8 Gas vent opening for horizontal configuration (closed)
9 Oil level sight glass, drive end
10 Oil drain, drive end
11 Drive shaft

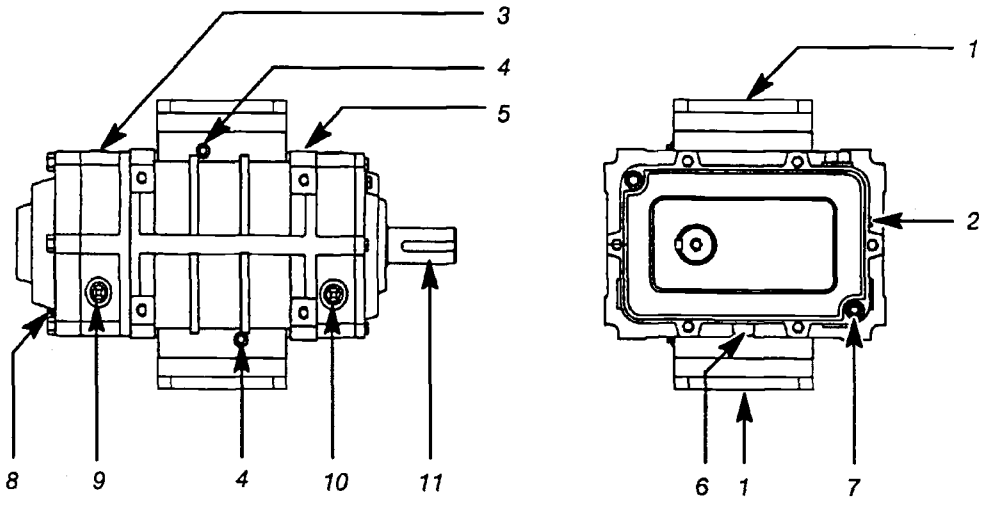
5.2.2 Horizontal flow configuration

- The drive shaft (11) is located at the left-hand rotor.

Attention! **In the horizontal flow configuration the rotary blower may only be operated with the drive shaft located at the left-hand rotor.**

If it is required to locate the drive shaft at the right-hand rotor in horizontal configuration, KAESER COMPRESSORS must be consulted first.

- See the following diagramm for the positions of the oil level sight glasses (9) / (10) and oil filler plugs (3) / (5).
- The gas vents (6) are open.
- The gas vents (2) for horizontal flow configuration are closed.
- See chapter 1.3 for oil capacities.



1 Flange adapter
2 Gas vent opening for vertical configuration (closed)
3 Oil filler plug, gear end
4 Test gauge plug
5 Oil filler plug, drive end
6 Gas vent opening (open)
7 Oil drain, drive end
8 Oil drain, gear end
9 Oil level sight glass, gear end
10 Oil level sight glass, drive end
11 Drive shaft

6 Installation

6.1 Installation Requirements

- Always operate rotary blowers in a dry and dust-free environment.
- Tapped holes are provided on the housing feet for mounting purposes (see chapter 1.6 for details of size).

Attention! **Mount the rotary blower on a stable and level base (flatness tolerance 0.002"). Take care not to stress the housing.**

☞ Check the drive shaft for ease of rotation by hand after installation.

- Leave the flanged ports blanked off until the pipework is finally connected to prevent foreign particles and/or contamination from entering blower.
- Arrange for suitable support of the pipework, inlet and discharge silencers and any other connected components.
- Only flexible pipe connections are permitted when connecting up the rotary blower to the pipework.

☞ Remove the blanks from the flanged ports before connecting up the pipework and inspect the air chamber of the rotary blower for the presence of dirt and foreign bodies. Clean, if necessary.

Vertical or horizontal configuration:

☞ During installation of the rotary blower check that the oil level sight glass and the oil filler plugs are correctly situated according to the intended configuration (Oil filler plugs at the gear end and the drive end), if necessary, change them (see chapter 5.2).

Attention! **Gas vent openings are located on the rotary blower for both horizontal or vertical configurations. They are plugged for shipping purposes: 2 metal plugs on the ride side and 2 plastic plugs at the bottom. Remove plastic plugs prior to installation of blower. Take care during installation that the open gas vent openings are always located at bottom of blower housing, regardless of which configuration is used (see chapter 5.2).**

☞ Close the gas vent openings intended for other configurations.

6.2 Drive

- The rotary blower can be driven by all standard drive sources available on the market.
- The rated power of the drive source should be greater than power requirements of blower. Motor should have 1.15 service factor.
- The speed of the drive source must be selected or controlled such that the maximum permissible rotor speed (see chapter 1.1) cannot be exceeded.
- Axial loading of the drive shaft must be avoided at all costs because the shaft bearings are not constructed to accept large axial forces.
- For maximum radial shaft and loading see chapter 1.1.
- Always use the centering thread on the end of the shaft when fitting pulleys and couplings.

Attention! **Protect pulleys and couplings against impact effect. Do not hammer on the shaft.**

6.2.1 Direct coupled drive with flexible coupling

- The shaft ends of the rotary blower and the drive source must be precisely aligned.
- Set up the drive source to the shaft end of the rotary blower.
- The tolerances for the run of the coupling as detailed in the manufacterer's technical specification must be complied with.

6.2.2 V-belt drive

- See chapter 1.1 for details of the maximum radial loading of the shaft end (V-belt tension) at the rotary blower.
- Misalignment of the V-belt drive may not exceed ± 0.5°. This applies to both the parallelism of the shaft axis spacing and the diagonal run of the V-belts resulting from axial offset.
- The pulleys for the rotary blower must be balanced.
- Check the tension of the V-belts and adjust if necessary when first putting into operation. After every V-belt change check the tension after 30 minutes and after 24 hours of further service.
  The regular maintenance period should be 500 service hours.

6.3 Compulsory Safety Equipment

Attention! **To ensure safe, automatic operation of the rotary blower the user must install safety and control equipment.**

6.3.1 Safety valve

Blow-off or vacuum limiting valve is necessary to prevent the nominal operating pressure from being exceeded or undercut.

Set point

The set point on the safety valve must correspond to the designed pressure difference.

Attention! **It must be ensured through the type of construction and the cross-section of the safety valve that the pressure difference cannot increase under any operational conditions whatsoever by more than 1 psi (this also applies at full blow-off capacity of the safety valve).**

The required safety valve blow-off volume is determined by the flow capacity defined for the rotary blower application.

The limiting values defined in chapter 1.1 must be complied with.

6.3.2 Check valve

A check valve is necessary to prevent a reversal of the specified direction of flow.

Attention! **The sizing of the check valve is determined by the size of the discharge port flange (see chapter 1.1) and the difference pressure approved for the application concerned.**

6.3.3 Display of temperature, pressure and vacuum

According to the application concerned, it is necessary to provide local display of the temperature, pressure or vacuum in the inlet and discharge ports.

6.3.4 Monitoring devices for operational parameters

To increase operational safety the parameters for

- discharge pressure
- pressure difference
- discharge temperature

must be monitored and interlocked to the drive.

6.3.5 Noise reduction measures

The use of inlet and discharge silencers and/or sound enclosures is decided by the application conditions for the rotary blower.

Personal protective measures (e.g. earmuffs) for the maintenance and operating personnel must be met according to the accident prevention regulations (see OSHA CFR 29 §1910).

6.3.6 Measures for the protection of personnel from sources of danger

Because of danger to maintenance and operating personnel, e.g. from rotating parts (belt drive), high temperatures and noise, protective measures preventing such dangers must be taken by the user (see OSHA CFR 29 §1910).

7 Putting into Operation

7.1 Points to be Observed before Putting into Operation

Every rotary blower is given a test run in the factory and carefully checked before shipment. The test run confirms that the rotary blower conforms to the specification data and runs perfectly. However, it is recommended that the rotary blower is inspected for damage that could have occurred during transport.

Attention! **The user carries full responsibility for the installation of the rotary blower and the compulsory safety equipment required.**

7.2 Points to be Observed before Starting the Rotary Blower:

NON-OBSERVANCE OF THIS OR OTHER REFERENCES (WARNING; ATTENTION) CAN LEAD TO ACCIDENTS CAUSING INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT.

- It is expected that the user employs safe working techniques and that all lawful operating and safety regulations are followed when operating this rotary blower.
- The user of this rotary blower is responsible for ist safe operating condition.
- Do not operate this rotary blower in spaces where heavy dust conditions, poisonous or inflammable gases could exist.
- The installation and operating regulations for ancillary equipment must be complied with.
- Carry out a check of all compulsory safety and monitoring equipment.
- Check the oil level and top up if necessary (see chapter 9.3).
- Check the direction of rotation of the rotary blower.

8 Operation

8.1 Starting and Stopping the Rotary Blower

The rotary blower is started by switching on the drive source in accordance with the safety regulations (see chapter 2) and the regulations for putting the drive source into operation.

Starting and stopping of the rotary blower is also subject to the application parameters specified by the use.

8.2 Action to be taken during a Malfunction

The general safety regulations (see chapter 2) and the corresponding local safety regulations must be observed during fault-finding.

Restarting after removal of a fault:

See chapter 7 "Putting into Operation" and the regulations for putting the drive source into operation.

Explanation of symbols for the following fault diagnosis:

*1 - Have checked by a specialist.

*2 - Refer to KAESER customer service.

8.2.1 Abnormal running noises

Possible fault:	Removal:
Backlash of the gears too large.	Check the backlash. If it is > 0.1 mm replace the timing gears; *1 or *2.
Bearing clearance too large.	Measure the clearance, replace the bearing if necessary; *1 or *2.
Rotors out of time.	Compare the conditions under use concerning pressure difference and speed with the delivery conditions. Check the rotor chamber for contamination and clean if necessary.

8.2.2 Excessive blower temperature

Possible fault:	Removal:
Operation with excessive pressure difference.	Check the pressure difference and fercorrect if necessary.
Contamination of the inlet filter causing degradation of volumetric efficiency.	Clean inlet filter.
Rotor clearance too large. tors and check with the manufactu-	Measure the clearance between the rorer. Rotor replacement could be necessary; *1 or *2.

8.2.3 Oil leaking into the air chamber

Possible fault:	Removal:
Oil level too high.	Drain the oil until the level is in the middle of the oil level sight glass.
Sealing rings worn.	Renew sealing rings.

8.2.4 Low inlet volume flow

Possible fault:	Removal:
Excessive rotor clearance caused by wear especially by heavily contaminated flow medium.	Measure the clearance between the rotors and check with the manufacturer. Rotor replacement could be necessary; *1 or *2.
Inlet flow resistance too high.	Clean the inlet filter.

9 Maintenance

9.1 Observe the following rules during all maintenance and service work:

Always ensure that personal protective measures are taken (e.g. the wearing of ear muffs) according to the accident prevention regulations.

Work on power driven equipment may only be carried out by trained or specialied personnel.

Before carrying out any maintenance work on the rotary blower, stop the blower lock out and tag out the main disconnect switch to prevent a restart. Isolate and de-pressurize the blower and attached piping to zero psig.

Ensure that no maintenance personnel are working on the rotary blower before restoring the power source.

See chapter 8.1 for restarting the rotary blower.

Ensure that all fuel and oil, auxiliary materials or agents and used parts are disposed of according to federal and local environmental regulations.

9.2 Regular Maintenance

Period	Work to be done	see chapter
200 hours after first putting into operation	change lubricating oil	9.4
monthly	check lubricating oil level*	9.3
1500 - 2500 hours*	change lubricating oil (mineral)	9.4
6000 – 8000 hours*	change lubricating oil (KAESER OMEGA synthetic)	9.4

* The maintenance period can vary depending on the service and environmental conditions. The oil should be changed at least once a year, even if the blower was not in operation.

We highly recommend that a record is kept of the maintenance work done (see chapter 11.1).

9.3 Lubricating Oil Level Check / Topping up the Lubricating Oil

Check the lubricating oil level at the gear end and the drive end monthly and before every start with the rotary blower stationary. The oil level as seen at the oil level sight glass changes because oft the rotating parts so that the lubricating oil level check must be carried out with the rotary blower stationary.

Attention!

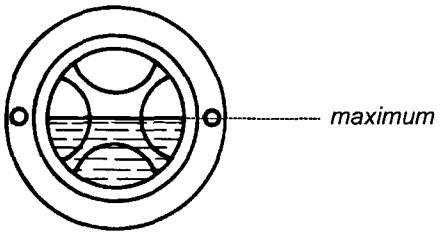
If the lubricating oil level has fallen to $^1/_8$" below the center of the oil level sight glass the oil must be topped off according to the lubricating oil recommendations.

Never top off the oil to a level above the center of the sight glass otherwise oil can enter the air chamber.

Attention! **The oil chambers of the gear and drive ends are not connected to each other.**

The lubricating oil, the rotary blower casing and ancillary parts can become extremely hot.

Danger of burning!



Oil level sight glass

To check the lubricating oil level:

☞ Stop the rotary blower (see chapter 8.1).

☞ Check the lubrication oil level at the oil level sight glass.

To top up the lubricating oil:

☞ Stop the rotary blower (see chapter 8.1) and lock out the power source to prevent a re-start.

Danger of burning by hot components.
Wait until the rotary blower has cooled down to below 140 °F.

☞ Open the corresponding oil filler by unscrewing the oil filler plug marked red (see also the sketch in chapter 5.1).

Attention! **Use a screen filter or a freshly opened oil can when topping up the lubricating oil.**

☞ Top up the lubricating oil to the maximum level.

☞ Screw the oil filler plug marked red back in again.

☞ Carry out a visual check for leaks.

9.4 Lubricating Oil Change

Carry out the lubricating oil change with the rotary blower in a warm state (approximately 130 °F).

Carry out the first oil change after approximately 200 hours of service.

Carry out all further oil changes approximately every 1500 - 2500 service hours for mineral lubricants and approximately 6000 – 8000 service hours for synthetic lubricants or at least once annually.

☞ Stop the rotary blower (see chapter 8.1) and lock out the power source to prevent a re-start.

Danger of burning by hot components.
Wait until the rotary blower has cooled down to below 140 °F for.

☞ Place a container ready to catch the used oil (see chapter 1.3 for the oil capacity).

The used oil must be collected and disposed of according to federal and local environmental regulations.

☞ Drain the oil by unscrewing the oil drain plug in the bottom of the casing.

☞ Open the corresponding oil filler by unscrewing the oil filler plug marked red (see also the sketch in chapter 5.1).

☞ Screw the oil drain plug back in again.

☞ Fill up with new lubricating oil (see chapter 9.3).

☞ Screw the oil filler plug marked red back in again.

☞ Carry out a visual check for leaks.

9.5 Cleaning the Rotary Blower

Because of the contact-free working principle of the rotors the clearances between the rotors and between the rotors and the casing allow, to a certain degree, the transport of a dusty mediums. Because of this fact, deposits can build up in the rotary blower.

☞ Stop the rotary blower (see chapter 8.1) and lock out the power source to prevent a re-start.

Danger of burning by hot components.
Allow the rotary blower to cool down to below 140 °F.

☞ Remove ancillary components such as inlet and discharge silencers.

☞ Clean the air chamber and rotors of hard deposits and sticky layers using a solvent.

Attention! **The type of solvent to use is determined by the type of contamination and the application process concerned.**

Observe all references to safety, danger and environmental regulations.

10 Spare Parts and After Sales Service

Please quote the following data for all inquiries and spare part orders: (see also nameplate)

1. Rotary blower, model:.....
2. Part number: .....
3. Serial number: .....
4. Description of the part: .....
5. Order number of the part:.....

Please provide the date of initial start-up when making claims under warranty!

Important: Transfer the data on the nameplate of the rotary blower into the nameplate (see chapter 1).

11 Appendix

11.1 Maintenance Schedule

Rotary blower:

Part number: **Serial number:**

Date	Description of work	Service hours	Signature

11.2 Safety information concerning contamination of compressors, blowers, vacuum pumps and components

Application and purpose

Every company is responsible for the health and safety of its employees. This extends to personnel who carry out servicing work at the company's premises or at the site of the user.

The attached declaration is intended to inform the service contractor of any possible contamination to be found in compressors, blowers, vacuum pumps or components sent to him for servicing. Based on this information, the service contractor can instigate the necessary protective measures when carrying out the service work.

Preparation for shipment

Before shipping the item(s), the sender should fill out and sign the attached Declaration of Contamination form (one for each item) and attach a copy to the shipping documents and a copy on the outside of the packaging.

Please note the following shipping regulations:

- drain all operating fluids
- remove filter elements
- make all openings airtight
- pack correctly
- ship in suitable container
- fix a copy of the Declaration of Contamination to the **outside** of the packaging

KAESER KOMPRESSOREN

Declaration of Contamination
concerning compressors, blowers, vacuum pumps and components

Repair and/or maintenance work will only be carried out on items for which a Declaration of Contamination form has been filled out and attached. **A completed Declaration is required for each item.** Any item not accompanied by a Declaration is liable to be returned untouched. Items that have been contaminated with microbiological, explosive or radioactive substances will only be accepted when accompanied by confirmation that they have been **fully decontaminated** according to regulation.
This Declaration may only be filled out and signed by the authorized representative of the ordering party (sender of the item).

Sender/dept.: _____
Contact name: _____
Address: _____
_____
Phone / Fax: _____

Reason for sending the item:
_____
_____
_____
_____
_____
_____
(use rear side of form if necessary)

Specification of the item:

Model/type name: _____
Part no..: _____
Serial no..: _____
Oil used: _____

Accessories:
_____
_____
_____

Condition of the item:

	yes	no	not known
- has it been used?	☐	☐	☐
- emptied/vented?	☐	☐	☐
- all openings airtight closed?	☐	☐	☐
- cleaned / decontaminated?	☐	☐	☐

Cleaning substance used: _____
Cleaning method: _____

Information on contaminants:

- with what substances has the item been in contact?

	Trade name	Chemical name	Characteristics
a)			
b)			
c)			
d)			

	yes	no	not known
- Are the substances listed above hazardous to health?	☐	☐	☐
- Are any hazardous substances given off by heating?	☐	☐	☐

Which? _____

We declare that the information given in this declaration is true and complete and that the signatory is authorized and in a position to make this declaration. We are aware of our liability for any damages resulting from false or incomplete information given in this declaration and we engage to hold the contractor free of claims from third parties for compensation for damages resulting from such incomplete or false information.

Name of the authorized signatory (please print): _____

_____ Date

_____ Authorized signature

Sender's company seal:

American Industrial Heat Transfer, Inc.

Sizing Program Air/Air COOLERS
Performance of One Unit
by Mark A. Loeffler

Customer: Onion Equipment
Model Selection: ACA 4 18 1 - 92546
Required Sq.ft: 10.3 Date: May 7, 2004
Unit Design Sq.Ft: 10.3 Job:

CONDITIONS					
TUBE SIDE			FAN SIDE		
Fluid		AIR			AIR
Specific Gravity		1.000	Altitude Sea Level +	ft	0
Flow Rate	SCFM	251.00	FAN Flow	CFM	1550
Calc Flow Rate	SCFM	251.0			
Flow Rate	ACFM	0.0		Fs	338
Calc Flow Rate	ACFM	222.0			
Operating Pressure	PSIG	3.9	Atmospheric Pressure	PSIA	14.696
Operating Pressure	In. H2O	0.0			
Temperature Entering	F	131.0			90.0
Temperature Exiting	F	108.7			93.8
Approach Temperature	F	18.7			
Specific Heat	BTU/lb-f	0.2500			0.2502
Viscosity	Cps	0.0189			0.0183
Conduct	Btu/hr ft^2 F/ft	0.0160			0.0154
Calculation					
Heat Load	BTU/hr	6314			6314
Mol weight		28.97			28.97
Density	lb/ft^3	0.0850			0.0722
Flow Rate	lbs/hr	1132.4			6713.4
Mass Vel.	lb/hr-ft^2	28081			5181
Pressure Drop	in.water	3.2			
Pressure Drop	^PSI	0.114	Face Velocity	Ft/min	709
Velocity Tubes	ft/sec	91.75	Fin Velocity	ft/min	1396.13
Reynolds	Nr	16639			5655
U value	clean	21.57		Dirt	21.56
Fouling	(hr)(ft^2)(F)/Btu	0.0000			
Selection					
Required Area	Sq.Ft.	10.30		LMTD	28.4
Surface Area	Sq.Ft.	10.31			
Construction					
Tube Diameter	inch	0.375	Fins Per Inch		8
Tube Wall	inch	0.025	Estimated 1=		1
Length Tubes	inch	18.0	Enter Number Passes		1
Parallel Tube Rows		4	Estimated Nozzle	inch	3.0
Number Tubes		70.00	Nozzle size	inch	3.00
Coil Weight Empty	Lbs	37.6	Manifold	inch	3.00

Materials

TUBES Copper FINS Aluminum CABINET Carbon Steel
MANIFOLDS Carbon Steel GASKETS None
COATING Enamel FAN Aluminum
Coil Size 18 x 18 Nozzle 3.0 NPT
HP .25 Phase 3 Hertz/Volts 60/208 230-460 Class X-Prf RPM 1725
Brazed coil core X Serviceable core

American Industrial Heat Transfer, Inc. 3905 Route 173 Zion, Illinois 60099
Toll Free: 1-800-338-5959 Fax:847-731-3440 Tel:847-731-1000

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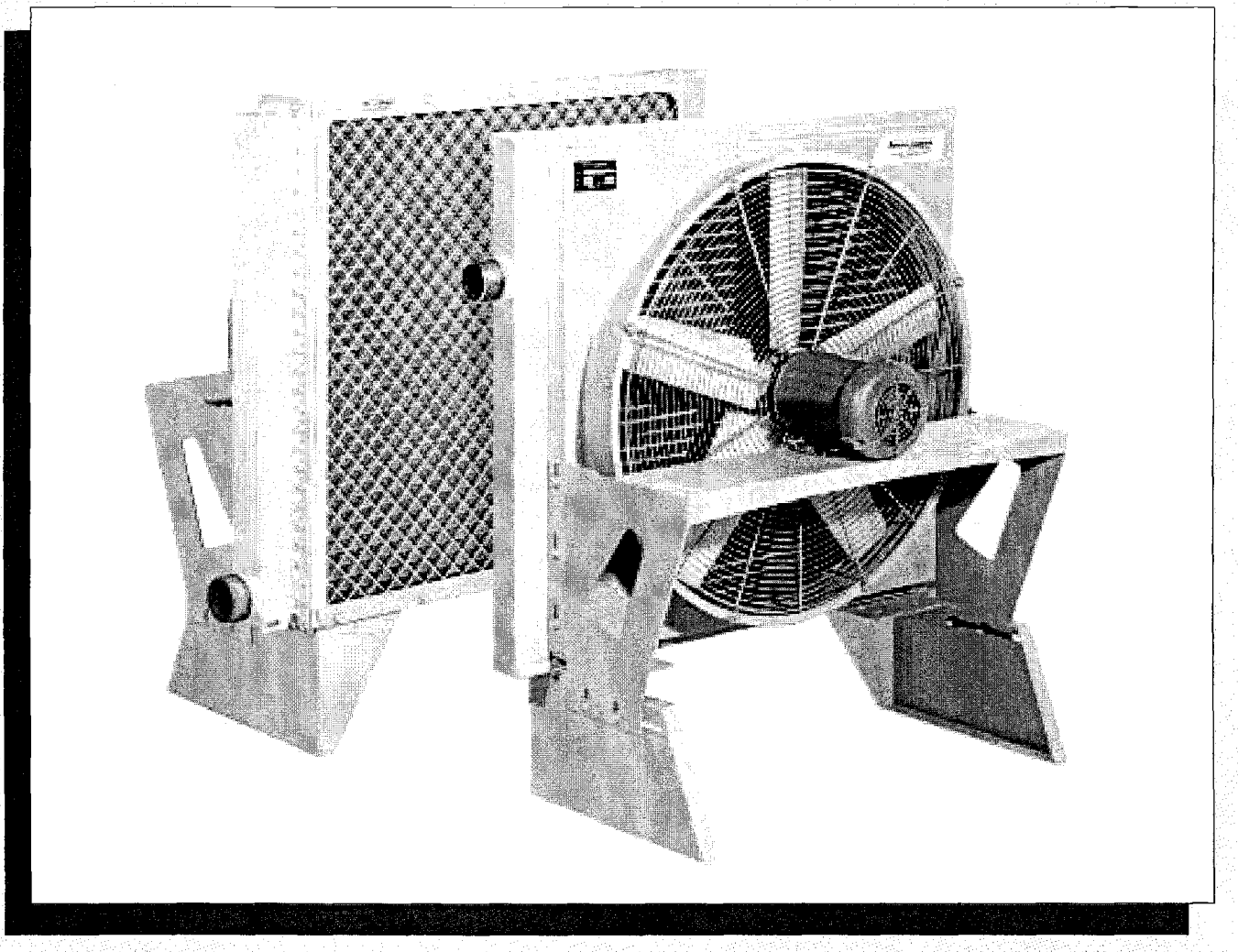


Compressed Gas or Vapor

Visit our Web Site at www.aihti.com

AFTERCOOLERS

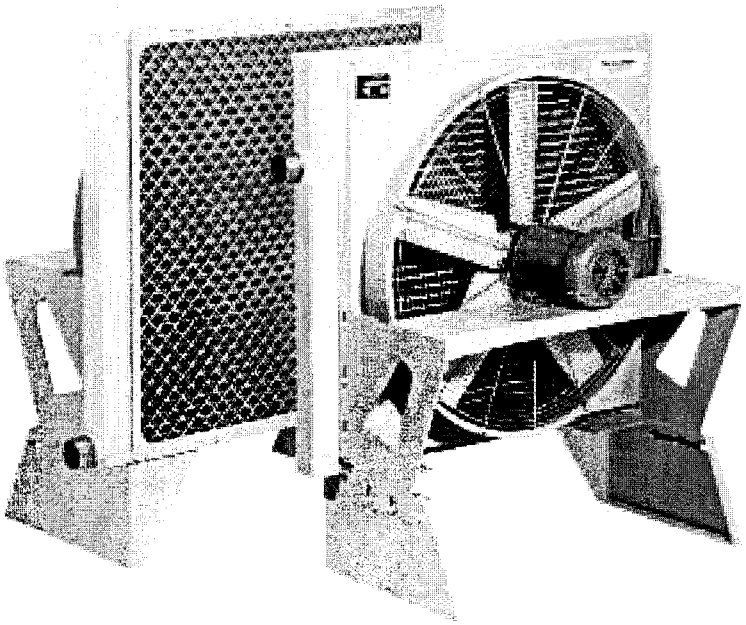
AIR COOLED

- Standard ports NPT, optional ANSI flange.
- Operating temperature of 400° F & pressure of 150PSI.
- Custom designs to fit your needs.
- Cools: Air, Compressors, Blowers, Steam vapors, Pneumatic systems, Vapor recovery systems etc..
- This brochure contains important user information such as: installation, serviceability, and warranty information.

ACA-2001 supersedes ACA-2000 and all previous printings.

STANDARD FEATURES

ACA - 3181 through ACA - 4362

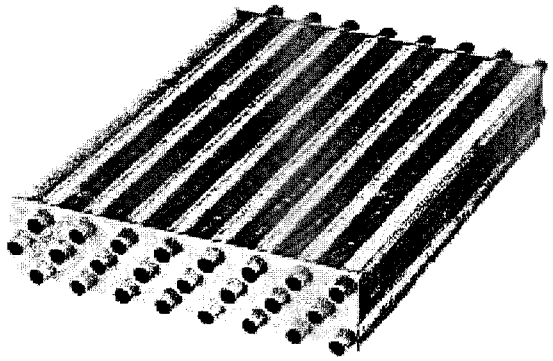


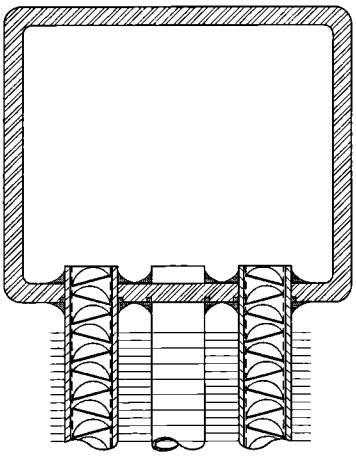
Brazed Core Construction

Air coolers are an essential part of any compressed air system, by cooling the air, and condensing water vapor into a liquid state for removal. When air is compressed, the compression induces heat into both the air and the water entrained in the air.
The American Industrial ACA series heat exchanger cools air with air, making it a simple inexpensive way to cool when compared to other water-cooled or refrigerant cooled systems. The unique compact *brazed* fin/tube design provides efficient cooling and low maintenance under the warmest environmental conditions. By using an ACA series air-cooled after cooler, machine tools will recieve cooler dryer air, provide longer trouble free life, experience less down time, and be cost effective to operate on a continuous basis.

SUPERIOR COOLING FINS

Copper tubes are mechanically bonded to highly efficient aluminum cooling fins. Die-formed fin collars provide a durable precision fit for maximum heat transfer.
Custom fin design forces air to become turbulent and carry heat away more efficiently than old flat fin designs.





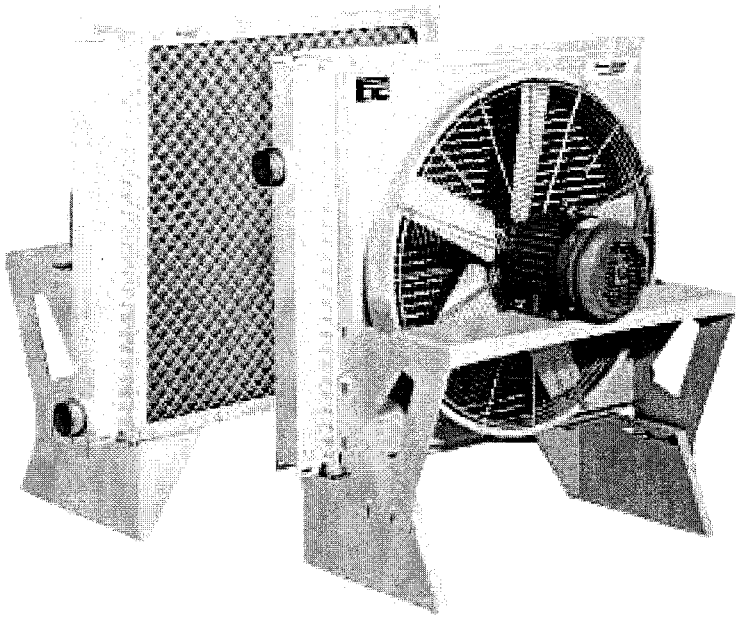
TANKS

State-of-the-art high temperature brazing method insures permanent bond and positive contact of tube to manifold, eliminating leaks and providing maximum service life.

Standard Construction Materials		Standard Unit Ratings	
Tubes	Copper	Operating Pressure	150 psig
Fins	Aluminum	Operating Temperature	400 °F
Cabinet & Pipes	Steel	Consult factory for optional materials and ratings.	
Fan Guard	Zinc plated steel		
Manifolds	Steel		

STANDARD FEATURES

ACA - 6301 through ACA 6602

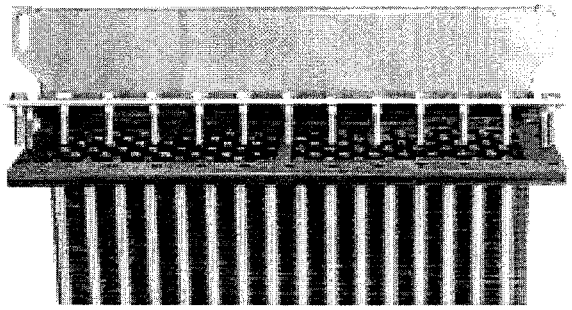


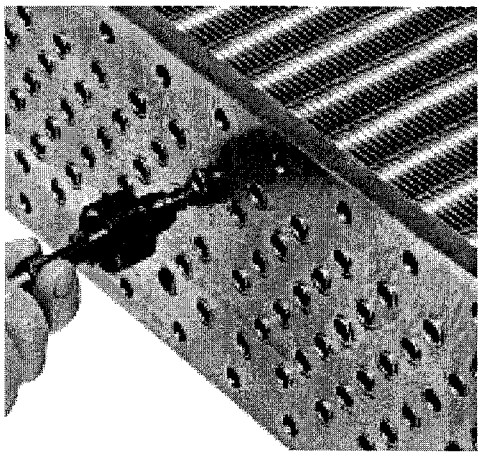
Serviceable Core® Construction

Air coolers are an essential part of any compressed air system, by cooling the air, and condensing water vapor into a liquid state for removal. When air is compressed, the compression induces heat into both the air and the water entrained in the air.
The American Industrial ACA series heat exchanger cools air with air, making it a simple inexpensive way to cool when compared to other water-cooled or refrigerant cooled systems. The unique compact *serviceable core®* design provides efficient cooling and low maintenance under the warmest environmental conditions. By using an ACA series air-cooled after cooler, machine tools will recieve cooler dryer air, provide longer trouble free life, experience less down time, and be cost effective to operate on a continuous basis.

SERVICEABLE CORE®

Core covers disassemble for easy access and cleaning. Repairable design for applications that require limited down time or in the event of a mishap requiring repair. Roller expanded tube to tube-sheet joint. 100% mechanical bond. Positive gasket seal is field replaceable for field maintenance or repair.





SUPERIOR COOLING FINS

Copper tubes are mechanically bonded to highly efficient aluminum cooling fins. Die-formed fin collars provide a durable precision fit for maximum heat transfer. Custom fin design forces air to become turbulent and carry heat away more efficiently than old flat fin designs.

Standard Construction Materials		Standard Unit Ratings	
Tubes	Copper	Operating Pressure	150 psig
Fins	Aluminum	Operating Temperature	400 °F
Cabinet & Pipes	Steel	Consult factory for optional materials and ratings.	
Fan Guard	Zinc plated steel		
Manifolds	Steel		

SELECTION

Compressed Air

Normally air compressors have airflow rates based upon the horsepower. Rotary Screw compressors normally discharge air at 180 °f - 200 °f, prior to after-cooling. Reciprocating compressors normally discharge air at 250 °f - 275 °f, prior to after-cooling. Compressors are rated in CFM or cubic feet per minute of free air at inlet conditions. For practical purpose we will use sea level at 68f and 36% relative humidity as a norm. Altitude, differing ambient conditions with respect to temperature and humidity will all affect heat exchanger performance to a degree. Moisture content in air actually increases the Btu/hr load requirement for cooling air by adding an additional condensing load to the gas load requirement. As air rapidly coolís, moisture will condense and separate into droplets, the more humidity present the more condensation will occur.

Sizing

The performance curves provided are for air. However, gases other than air may be applied to this cooler with respect to compatibility by applying a correction factor. Please take time to check the operating specifications thoroughly for material compatibility, pressure, and size before applying an American Industrial heat exchanger into your system.

Terms

Approach Temperature is the desired outlet temperature of the compressed gas minus the inlet ambient air temperature of the external air flowing over the coil.
SCFM (Standard Cubic Feet per Minute)
A cubic foot of air at 68 °f, 14.696 psia, & 36% relative humidity, per minute.
CFM (Cubic Feet per Minute)
Air at inlet atmospheric conditions.
ACFM (Actual Cubic Feet per Minute)
Air at current pressure, temperature, & humidity conditions without reference to a standard.

To Determine the Heat Load

If the heat load (Btu/hr) is unknown a value can be calculated based upon system operational requirements. To properly calculate the heat load (Btu/hr) to be rejected, several items must be known with certainty (see below).

- Flow rate SCFM (standard cubic feet pr minute)
- Type of gas and its makeup.
- System inlet pressure to the heat exchanger.
- Ambient temperature where the heat exchanger will be located (hotest condition).
- Temperature of the gas at the heat exchanger inlet.
- Temperature of the gas desired at heat exchanger outlet.
- Maximum acceptable pressure loss or cooled gas.

Using The Chart

American Industrial has created a quick reference chart for selecting ACA heat exchangers for Rotary Screw compressors. (see pg. 6) [This chart offers basic information based upon compressor horsepower and average airflow rates. To properly use the chart, select the compressor horsepower at the left or the air flow rate. Next select the approach to ambient that is desired. Where the two columns intersect is shown the proper ACA model number.]

Using The Graphs

American Industrial provides performance graphs for ease of model selection. The following calculation examples (pg. 5), illustrate formulas to determine model selection sizes. It should be noted that there are some assumptions made when applying the basic principles for calculation in the formula. Altitude, humidity, materials, pressures, etc... all contribute to the final selection. Contact American Industrial for more detailed calculation.

Selection

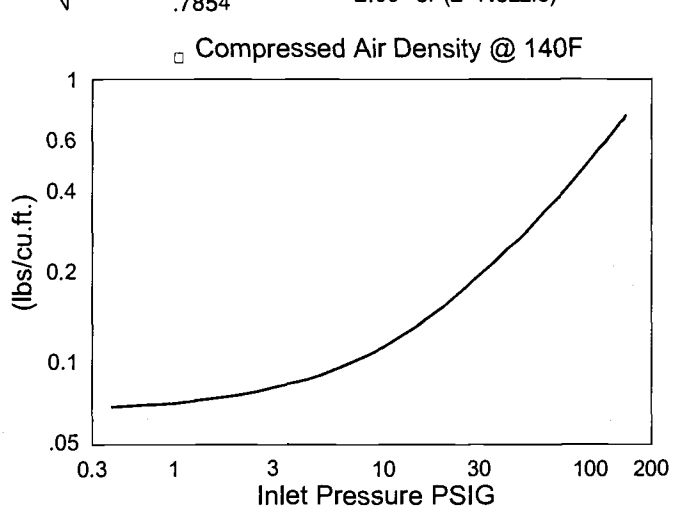
The selection process is important, many considerations should be made when selecting a heat exchanger. Once the proper Fs requirement is calculated, it is now time to apply the data to the graph and make a selection.
1) Find the Flow rate in SCFM located at the bottom of the graph. Follow the graph line up until it matches the calculated Fs from your calculations. If the point falls just above one of the model graphed lines, select the next larger size. If the point is on a line select it as your choice.
2) Check carefully the pressure differential. Units with operating pressures from 70+ psig will have no greater than 2.0 psid within the published flow range. For lower inlet pressure see the pressure drop curves for more detail.
3) Calculate a Nozzle size using the nozzle size calculation to verify your selection has the proper port sizes for your required inlet pressure.

Formula:

$$\text{Nozzle Size} = \sqrt{\frac{\left[\frac{(\text{SCFM} \times 4.512)}{(270{,}000 \times d)} \times 144\right]}{.7854}}$$

Example:
Flow rate = 200 SCFM
Pressure = 15 psig
Density = (d) from Compressed Air Density Graph

$$\sqrt{\frac{\left[\frac{(200 \times 4.512)}{(270{,}000 \times .14)} \times 144\right]}{.7854}} = 2.09\text{" or (2" Nozzle)}$$



Examples:

Application 1 Air Rotary Screw Compressor

Determine the heat load "Q" =Btu/hr — $Q = [SCFM \times CF \times (T_1-T_2)]$ or $[350 \times 1.13 \times 105^\circ] = 41{,}528$ Btu/hr
T_1 = Inlet gas temperature: 200°f
T_2 = Outlet gas temperature: Ambient + 10°f= (95°f) — Determine the Fs = $\frac{Btu/hr}{T_2 - T_a}$ or $\frac{41{,}528}{10}$ = **4,153 Fs**
T_a = Ambient temperature: 85°f
Airflow rate: 350 SCFM
PSIG = Operating Pressure 100 psig
CF = Correction factor: 1.13 — CF = (.0753 x S x C x60) or (.0753 x 1.0 x .25 x 60) = 1.13
S = Specific gravity with air being 1.0
C = Specific heat (Btu/Lb °f): .25

Application 2 Methane Gas

Determine the heat load "Q" = Btu/hr — $Q = [SCFM \times CF \times (T_1-T_2)]$ or $[500 \times 1.428 \times 210^\circ] = 149{,}940$ Btu/hr
T_1 = Inlet gas temperature: 300°f
T_2 = Outlet gas temperature: 90°f — Determine the Fs = $\frac{Btu/hr}{T_2 - T_a}$ or $\frac{149{,}940}{30}$ = **4,998 Fs**
T_a = Ambient temperature: 60°f
Airflow rate: 500 SCFM
PSIG = Operating pressure: 190 psig
CF = Correction factor: 1.428 — CF = (.0753 x S x C x 60) or (.0753 x .55 x .575 x 60) = 1.428
S = Specific gravity with air being 1.0: .55
C = Specific heat (Btu/Lb °f)

Application 3 Air Sparge Air Compressor

Determine the heat load "Q" = Btu/hr — $Q = [SCFM \times CF \times (T_1-T_2)]$ or $[76 \times 1.13 \times 150^\circ] = 12{,}882$ Btu/hr
T_1 = Inlet gas temperature: 250°f
T_2 = Outlet gas temperature: 100°f — Determine the Fs = $\frac{Btu/hr}{T_2 - T_a}$ or $\frac{12{,}882}{10}$ = **1,288 Fs**
T_a = Ambient temperature: 90°f
CF = Correction Factor: 1.13
PSIG = Operating pressure: 2 psig
Airflow rate: 90 ACFM — Convert to SCFM = $\frac{ACFM \times (PSIG + 14.7) \times 528}{(T_1 + 460) \times 14.7} = \frac{90 \times 16.7 \times 528}{710 \times 14.7} = 76$ SCFM
S = Specific gravity with air being 1.0
C = Specific heat (Btu/lb °f): .25
ΔP = 5" water column or less

Pressure Drop

Since gas is compressible the density of the gas changes from one temperature or pressure to the next. While the mass flow rate may not change, the pressure differential across the heat exchanger will change dramatically from high (70-125 psig) to low (1-5 psig) pressure. A low pressure condition requires larger carrying lines to move flow than does the same gas rate under a higher pressure. At lower pressures the differential pressure across the heat exchanger can be quite high compared to the same flow rate at a higher pressure. For that reason it is suggested that you check the pressure differential graphs (pg. 12) when making your selection.

The ACA series heat exchanger is designed to be easily modified to accept larger port sizes in the event your system pressure is low. (See nozzel calculation pg. 4) Consult our engineering department for more exacting information regarding pressure differential issues.

SELECTION

ROTARY SCREW COMPRESSORS

(200°F @125 PSI & 36% relative humidity)

Compressor Horse Power (HP)	Average Air Discharge Cubic feet per minute (SCFM)	Model Size Selection *Approach Temperature °F (T_2 - T_a)			
		5°F	10°F	15°F	20°F
15	60	ACA - 3302	ACA - 3242	ACA - 3242	ACA - 3182
20	80	ACA - 3302	ACA - 3242	ACA - 3242	ACA - 3182
30	130	ACA - 3362	ACA - 3302	ACA - 3242	ACA - 3242
40	165	ACA - 3362	ACA - 3302	ACA - 3302	ACA - 3242
60	250	ACA - 4362	ACA - 3362	ACA - 3302	ACA - 3302
75	350	ACA - 6362	ACA - 4362	ACA - 3362	ACA - 3302
100	470	ACA - 6362	ACA - 6362	ACA - 3362	ACA - 3362
125	590	ACA - 6422	ACA - 6362	ACA - 4362	ACA - 3362
150	710	ACA - 6422	ACA - 6362	ACA - 6362	ACA - 4362
200	945	ACA - 6482	ACA - 6422	ACA - 6362	ACA - 6362
250	1160	ACA - 6482	ACA - 6422	ACA - 6362	ACA - 6362
300	1450	ACA - 6542	ACA - 6482	ACA - 6422	ACA - 6362
350	1630	ACA - 6542	ACA - 6482	ACA - 6422	ACA - 6362
400	1830	ACA - 6602	ACA - 6482	ACA - 6422	ACA - 6422
500	2150	ACA - 6602	ACA - 6542	ACA - 6482	ACA - 6422

***Approach Temperature** - is the desired outlet temperature of the compressed gas minus the inlet ambient air temperature of the external air flowing over the coil.

T_2 - Outlet gas temperature

T_a - Ambient temperature

Example of a model:

ACA - 3242 - 3 - N - ____ - ____

Model
ACA

Number of Passes
1P = 1 pass
2P = 2 pass

Size

Drive Type
1 = 1ph/60hz/115-230v
1EXP = 1ph/60hz/115-230v
3 = 3ph/60hz/230-460v
3EXP = 3ph/60hz/230-460v
5 = 3ph/60hz/575v
0 = no motor

Connections
N = NPT
A = ANSI 150#RF Flange

Core Coating
T = Heresite
X = Epoxy
Blank = Enamel (Standard)

Cabinet Coating
G = Galvanize
X = Epoxy
Blank = Enamel (Standard)

Using the performance graphs

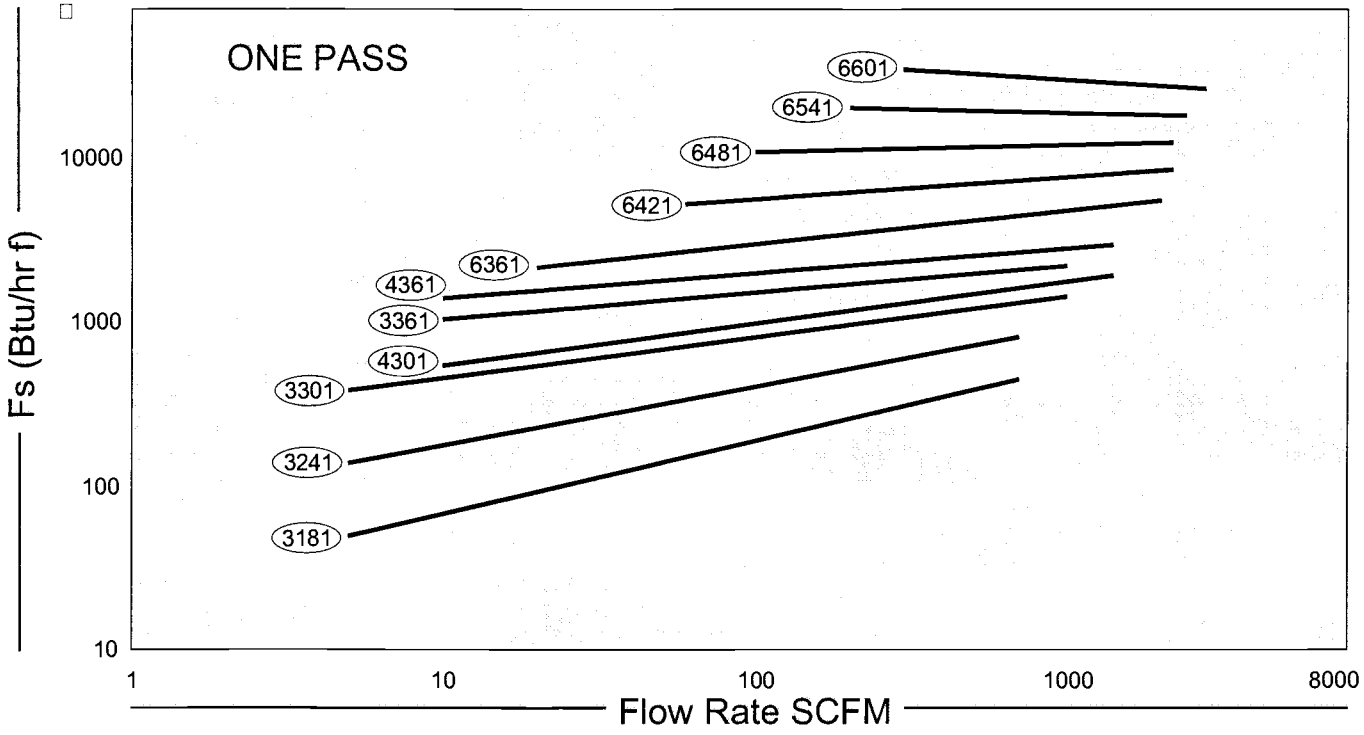
The Flow vs. Fs graph is calculated based upon SCFM units.

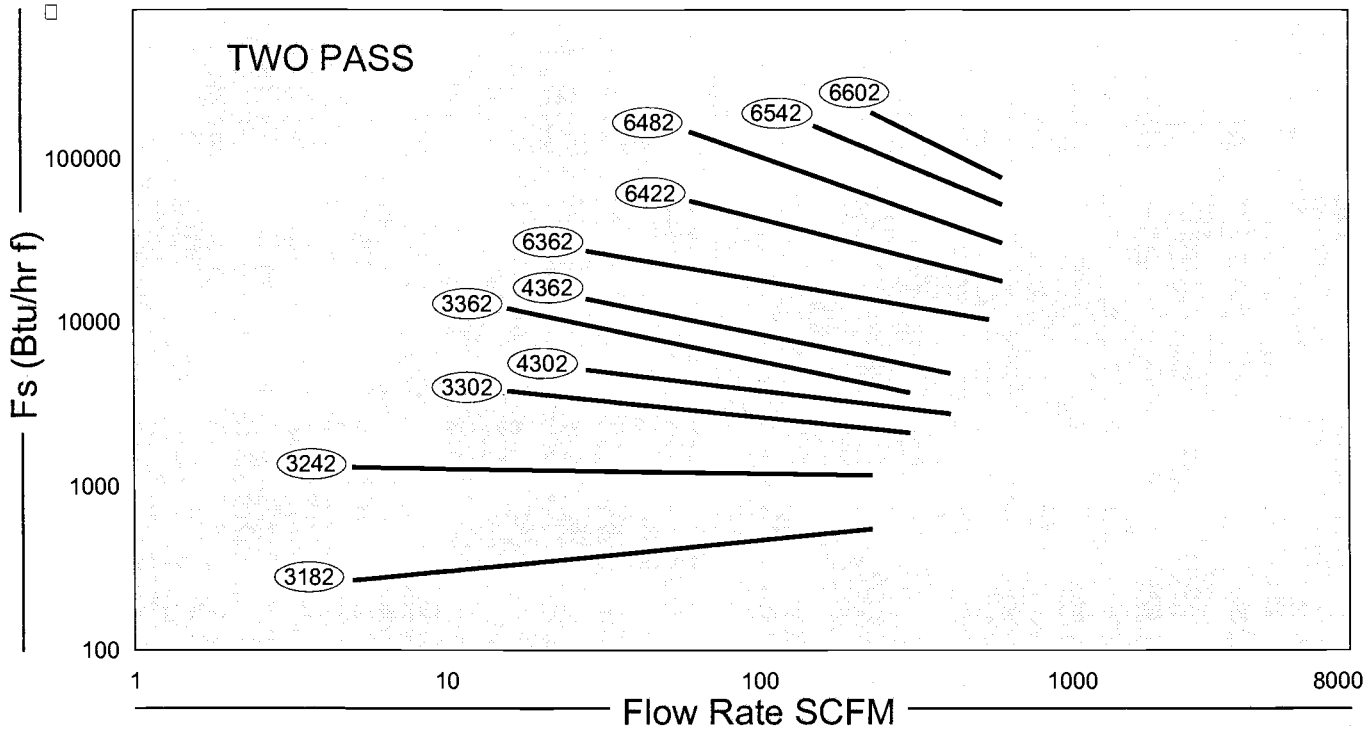
To convert volumetric Actual Cubic Feet per Minute (ACFM) into Standard Cubic Feet per Minute (SCFM) see page 5.

To select a model, locate the flow rate in SCFM located at the bottom of the graph. Proceed upward on the graph until the SCFM flow rate intersects with the calculated Fs. The curve closest, on or above the intersection point is the proper selection.

Using the one pass graph or two-pass graph depends upon pressure differential, flow, and performance requirements. The actual surface area for one or two pass units is the same. However, the airflow velocity in the tubes increases with the number of passes giving slightly higher pressure differentials and better cooling performance.

PERFORMANCE





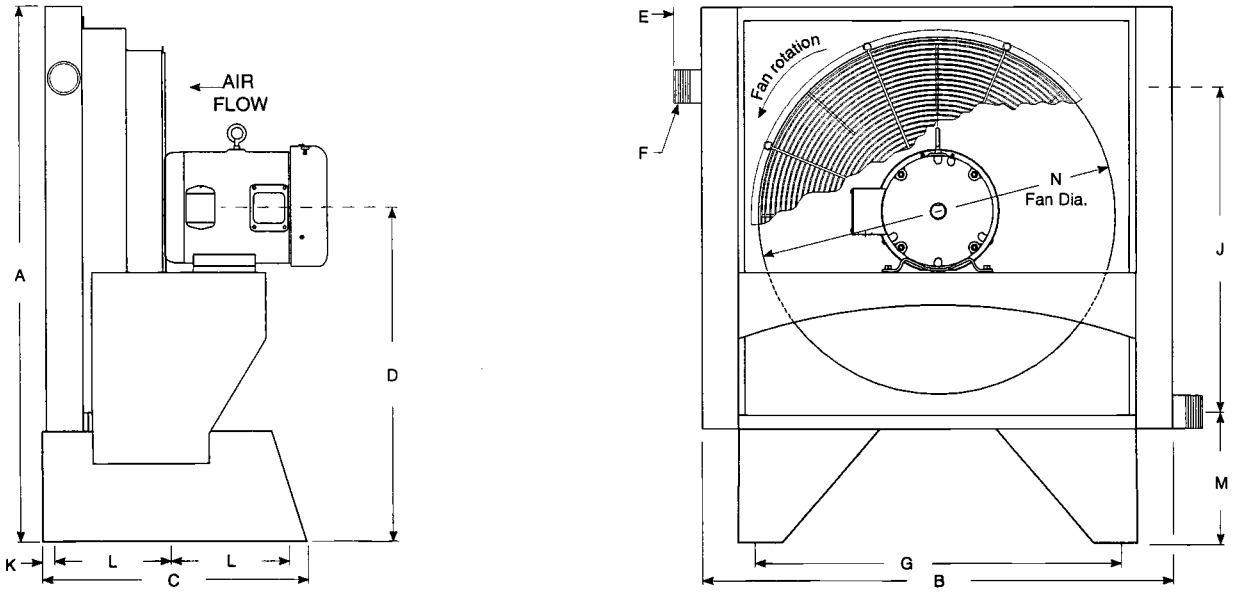
Example

Application #3 (p.5)

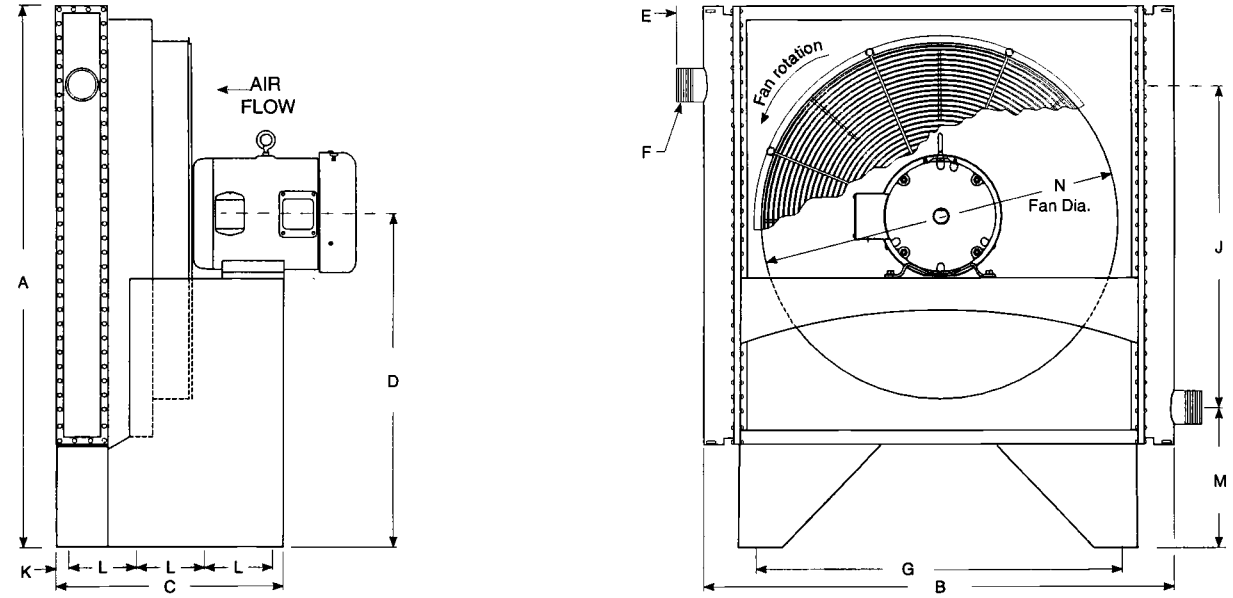
SCFM = 76
ΔPSI required = 5" H2O
Model selection = ACA-6421-3
Fs = 1,288 Nozzle check (p.4) = 3.10 or 3"NPT

$$Fs = \frac{\text{Heat Load (Btu/hr)}}{\text{Process exiting temperature } (T_2) \text{ from cooler} - \text{Ambient air exiting the cooler } (T_a) \text{ the cooler}}$$

ELECTRIC MOTOR



ACA - 3181 through ACA - 4361

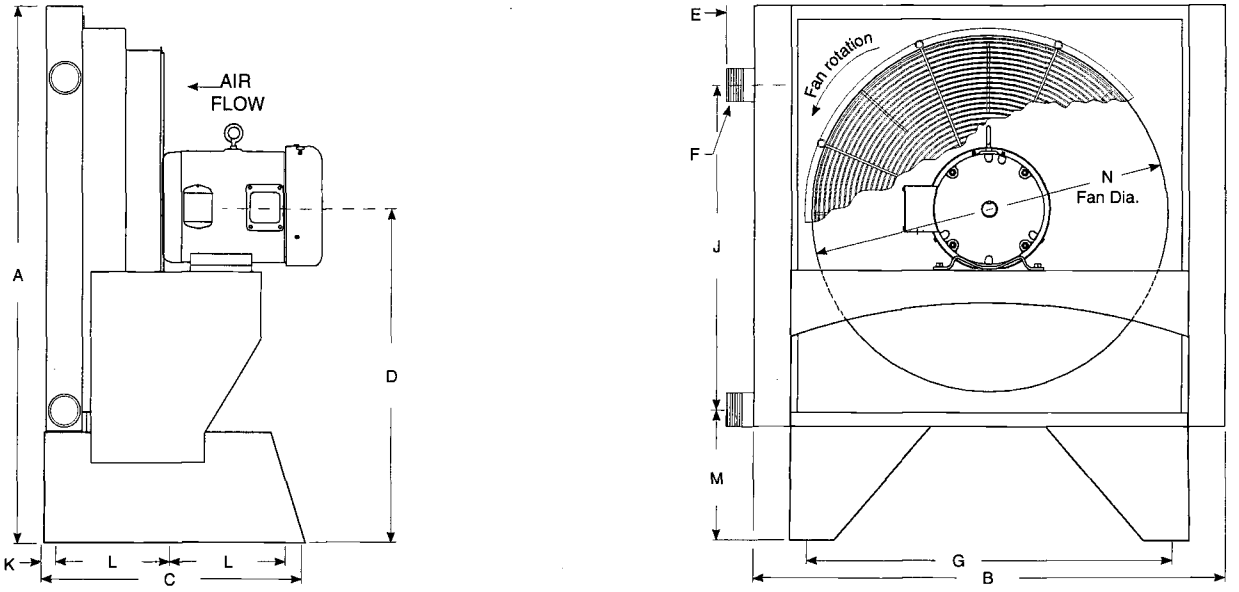


ACA - 6361 through ACA - 6601

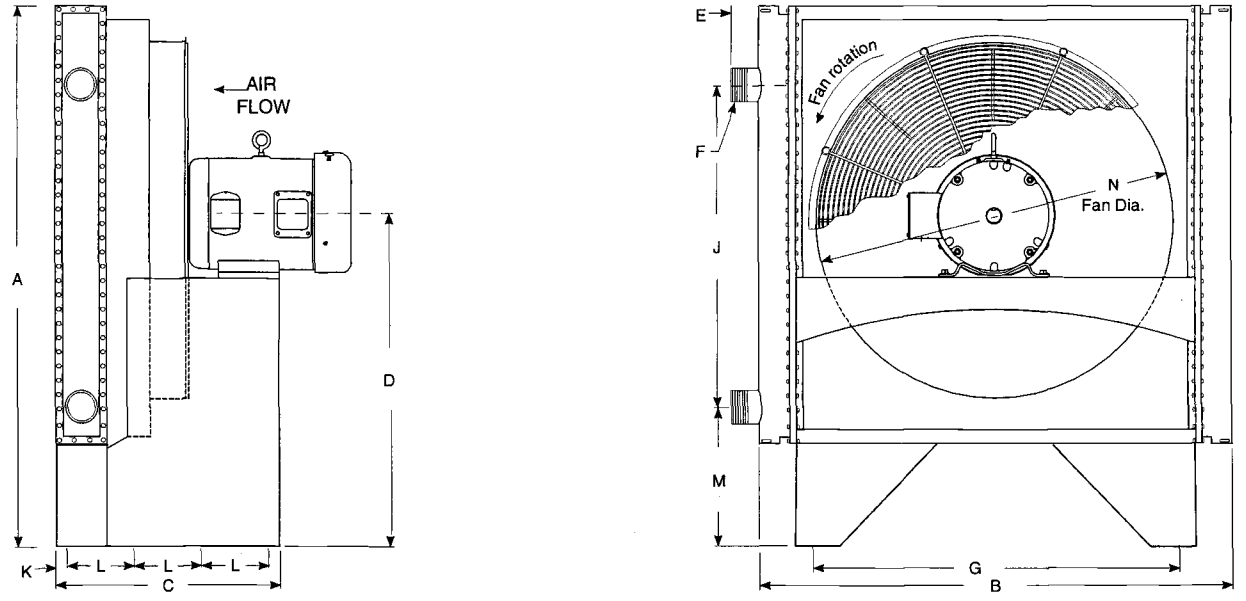
DIMENSIONS (inches)												
Model	A	B	C	D	E	F NPT	G	J	K	L	M	N
ACA - 3181	30.6	23.0	19.8	20.25	2.5	1.5	16.3	14.3	1.5	8.38	11.0	14.0
ACA - 3241	36.5	29.0	19.8	23.25	2.5	1.5	22.3	18.9	1.5	8.38	11.0	22.0
ACA - 3301	42.3	35.0	19.8	26.25	2.5	2.0	28.3	23.0	1.5	8.38	11.2	28.0
ACA - 4301	42.3	36.0	19.8	26.25	2.5	2.5	28.3	23.0	1.5	8.38	11.4	28.0
ACA - 3361	48.5	41.0	19.8	29.25	2.5	2.0	34.3	27.4	1.5	8.38	11.2	32.0
ACA - 4361	48.5	42.0	19.8	29.25	2.5	2.5	34.4	27.4	1.5	8.38	11.4	32.0
ACA - 6361	48.5	43.9	19.8	29.25	2.5	3.0	34.3	26.0	1.5	8.38	12.7	32.0
ACA - 6421	54.5	50.8	27.36	32.25	2.5	4.0	40.3	29.4	2.0	6.75	13.3	36.0
ACA - 6481	60.6	56.8	27.36	35.25	2.5	4.0	46.3	34.1	2.0	6.75	13.3	42.0
ACA - 6541	66.6	62.8	28.83	38.25	2.5	4.0	52.3	38.6	2.0	6.75	13.3	48.0
ACA - 6601	72.4	67.9	30.6	41.25	2.5	4.0	58.3	43.05	2.0	6.75	13.3	48.0

NOTES: We reserve the right to make reasonable design changes without notice.
Represents the options for motor drive.

ELECTRIC MOTOR



ACA - 3182 through ACA - 4362



ACA - 6362 through ACA - 6602

DIMENSIONS (inches)												
Model	A	B	C	D	E	F NPT	G	J	K	L	M	N
ACA - 3182	30.6	23.0	19.8	20.25	2.5	1.5	16.3	14.3	1.5	8.38	11.0	14.0
ACA - 3242	36.5	29.0	19.8	23.25	2.5	1.5	22.3	18.9	1.5	8.38	11.0	22.0
ACA - 3302	42.3	35.0	19.8	26.25	2.5	2.0	28.3	23.0	1.5	8.38	11.2	28.0
ACA - 4302	42.3	36.0	19.8	26.25	2.5	2.5	28.3	23.0	1.5	8.38	11.4	28.0
ACA - 3362	48.5	41.0	19.8	29.25	2.5	2.0	34.3	27.4	1.5	8.38	11.2	32.0
ACA - 4362	48.5	42.0	19.8	29.25	2.5	2.5	34.4	27.4	1.5	8.38	11.4	32.0
ACA - 6362	48.5	43.9	19.8	29.25	2.5	3.0	34.3	26.0	1.5	8.38	12.7	32.0
ACA - 6422	54.5	50.8	27.36	32.25	2.5	4.0	40.3	29.4	2.0	6.75	13.3	36.0
ACA - 6482	60.6	56.8	27.36	35.25	2.5	4.0	46.3	34.1	2.0	6.75	13.3	42.0
ACA - 6542	66.6	62.8	28.83	38.25	2.5	4.0	52.3	38.6	2.0	6.75	13.3	48.0
ACA - 6602	72.4	67.9	30.6	41.25	2.5	4.0	58.3	43.05	2.0	6.75	13.3	48.0

STANDARD FEATURES

ELECTRIC MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
ACA- 3181/2- 1	.25	1	60-50	115/230 - 90/190	1725-1440	48	TEFC	3.2/1.6/2.8-1.4	1.15	NO
ACA- 3181/2 -3	.25	3	60-50	208 - 230/460 - 190/380	1725-1440	48	TEFC	1.3/.65/1.1-.55	1.15	NO
ACA- 3241/2 -1	.25	1	60-50	115/230 - 90/190	1140-950	56	TEFC	6.8/3.1-3.4	1.15	NO
ACA- 3241/2 -3	.25	3	60-50	208 - 230/460 - 190/380	1140-950	56	TEFC	1.7/2.0/1.0	1.15	NO
ACA- 3301/2 -1	.5	1	60-50	115/230 - 90/190	1140-950	56	TEFC	9.6/4.7-4.8/10.4/5.2	1.15	NO
ACA- 3301/2 -3	.5	3	60-50	208 - 230/460 - 190/380	1140-950	56	TEFC	2.4-2.7/1.35-2.5/1.25	1.15	NO
ACA- 4301/2 -1	.5	1	60-50	115/230 - 90/190	1140-950	56	TEFC	9.6/4.7-4.8/10.4/5.2	1.15	NO
ACA- 4301/2 -3	.5	3	60-50	208 - 230/460 - 190/380	1140-950	56	TEFC	2.4-2.7/1.35-2.5/1.25	1.15	NO
ACA- 3361/2 -3	1.0	3	60-50	208 - 230/460 - 190/380	1140-950	56	TEFC	4/2-3.7/1.85	1.15	NO
ACA- 4361/2- 3	1.0	3	60-50	208 - 230/460 - 190/380	1140-950	56	TEFC	4/2-3.7/1.85	1.15	NO
ACA- 6361/2 -3	3.0	3	60-50	208 - 230/460 - 190/380	1725-1440	182T	TEFC	8.4-6.8/3.4	1.15	NO
ACA- 6421/2 -3	5.0	3	60-50	208 - 230/460 - 190/380	1140-950	213T	TEFC	8.2-7.6/3.8	1.15	NO
ACA- 6481/2 -3	5.0	3	60-50	208 - 230/460 - 190/380	1140-950	213T	TEFC	14.0/7.0	1.15	NO
ACA- 6541/2 -3	7.5	3	60-50	208 - 230/460 - 190/380	1140-950	254T	TEFC	20.4/10.2	1.15	NO
ACA- 6601/2 -3	10	3	60-50	208 - 230/460 - 190/380	1140-950	256T	TEFC	28.0/14.0	1.15	NO

ELECTRIC MOTOR NOTES:

1) Motor electrical ratings are an approximate guide and may vary between motor manufacturers. Consult ratings on motor data plate prior to installation and operation.
2) Explosion proof, high temperature, severe duty, chemical, IEC, Canadian Standards Association, and Underwriters Laboratory recognized motors are available upon request.
3) American Industrial reserves the right to enact changes to motor brand, type and ratings regarding horsepower, RPM,FLA,and service factor for standard products without notice. All specific requirements will be honored without change.
4) Fan rotation is clockwise when facing the motor shaft.
5) The above motors contain factory lubricated shielded ball bearings (no additional lubrication is required).
6) **Abbreviation Index**
   TEFC.....Totally Enclosed, Fan Cooled
   EXP.....Explosion Proof
   CF.....Consult Factory

CLASS I,DIV.1, GROUP D or CLASS II,DIV.2, GROUP F & G EXPLOSION PROOF MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
ACA- 3181/2 -1	.25	1	60	115/230	1725	48	EXP	5.8/2.8	1.0	YES
ACA- 3241/2 -3	.25	3	60	208-230/460	1725	48	EXP	1.4-1.3/.65	1.0	YES
ACA- 3241/2 -1	.33	1	60	115/230	1140	56	EXP	7.8/3.5	1.0	YES
ACA- 3301/2 -3	.33	3	60	208-230/460	1140	56	EXP	1.18-1.6/8	1.0	YES
ACA- 3301/2 -1	.50	1	60	115/230	1140	56	EXP	9.4/4.8	1.0	YES
ACA- 4301/2 -3	.50	3	60	208-230/460	1140	56	EXP	2.5-2.4/1.2	1.0	YES
ACA- 4301/2 -1	.50	1	60	115/230	1140	56	EXP	9.4/4.8	1.0	YES
ACA- 3361/2 -3	.50	3	60	208-230/460	1140	56	EXP	2.5-2.4/1.2	1.0	YES
ACA- 4361/2 -3	1.0	3	60	230/460	1140	56	EXP	3.8/1.9	1.0	YES
ACA- 6361/2 -3	1.0	3	60	230/460	1140	56	EXP	3.8/1.9	1.15	YES
ACA- 6421/2 -3	3	3	60	230/460	1725	182	EXP	8.8/4.4	1.15	YES
ACA- 6481/2 -3	5	3	60	230/460	1160	215	EXP	15.0-13.8/6.9	1.15	YES
ACA- 6541/2 -3	5	3	60	230/460	1160	215	EXP	15.0-13.8/6.9	1.15	YES
ACA- 6601/2 -3	7.5	3	60	230/460	1160	256	EXP	21.6-20.4/10.2	1.15	YES
ACA- 3181/2 -3	1.0	3	60	230/460	1160	256	EXP	29-26/13	1.15	YES

NOTE: Basic electric drive units are supplied with one of the corresponding above listed motors.

STANDARD FEATURES

575 VOLT ELECTRIC MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
ACA- 3181/2 -5	1/3	3	60	575	1725	56	TEFC	.52 .56	1.15	NO
ACA- 3241/2 -5	1/3	3	60	575	1140	56	TEFC	.52 .56	1.15	NO
ACA- 3301/2 -5	1/2	3	60	575	1140	56	TEFC	1.08	1.15	NO
ACA- 4301/2 -5	1/2	3	60	575	1140	56	TEFC	1.08	1.15	NO
ACA- 3361/2 -5	1	3	60	575	1140	56	TEFC	1.6	1.15	*
ACA- 4361/2 -5	1	3	60	575	1140	56	TEFC	1.6	1.15	*
ACA- 6361/2 -5	3	3	60	575	1725	182T	TEFC	3.3	1.15	*
ACA- 6421/2 -5	5	3	60	575	1140	213T	TEFC	5.9	1.15	*
ACA- 6481/2 -5	5	3	60	575	1140	213T	TEFC	5.9	1.15	*
ACA- 6541/2 -5	7.5	3	60	575	1140	254T	TEFC	8.0	1.15	*
ACA- 6601/2 -5	10	3	60	575	1140	256T	TEFC	10.5	1.15	*

COMMON DATA

Model	Air Flow		Sound Level	Weight		Serviceable
	CFM	m^3/s	dB(A) @ 7ft	w/ motor	w/o motor	Core
ACA-3181/2	1550	0.731	72	131	111	NO
ACA-3241/2	2900	1.36	76	154	134	NO
ACA-3301/2	4450	2.10	76	184	160	NO
ACA-4301/2	4450	2.10	76	211	187	NO
ACA-3361/2	6350	2.99	79	243	205	NO
ACA-4361/2	6350	2.99	79	289	251	NO
ACA-6361/2	10500	4.95	91	402	342	YES
ACA-6421/2	14300	6.75	87	636	443	YES
ACA-6481/2	18700	8.82	88	753	560	YES
ACA-6541/2	23350	11.02	91	938	691	YES
ACA-6601/2	29300	13.83	91	1104	835	YES

NOTES:
a) * Represents the options for motor drive.
b) To estimate the sound level at distances other than 7 feet (4 meters) from the cooler, add 6 db for each halving of distance, or substract 6 db for each doubling of the distance.

Pressure Drop Graphs (see page 12)

Each graph represents a specific pressure drop at differing flow rates and inlet pressures. The four graphs for each model series size represents the more popular milestone pressure differentials commonly applied.

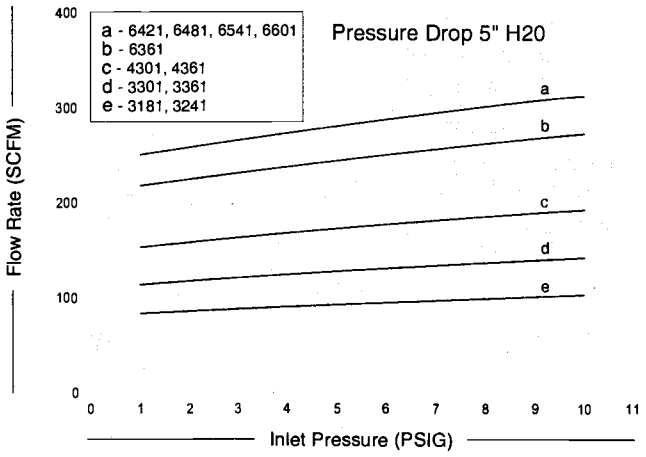
To use the graphs for selection purposes follw the steps below.

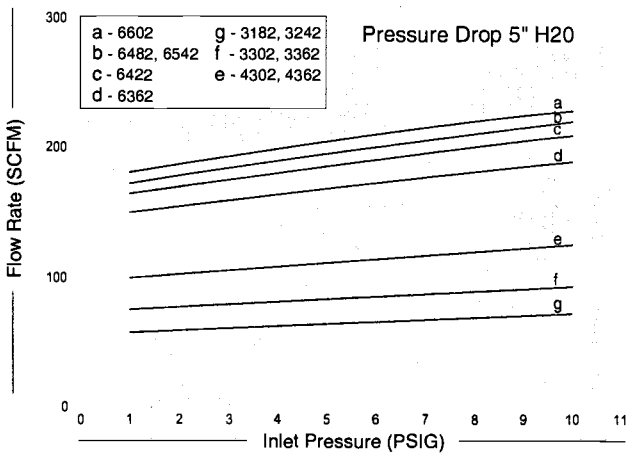
1) Locate the operating pressure at the bottom of the desired pressure drop chart.
2) Locate the flow rate in SCFM at the left end of the chart.
3) Follow the "Pressure" line vertically and the "Flow" line horizontally until they cross, note the location.
4) The curve on, or closest above will be exact or less pressure drop than requested and suitable for the application.
5) There may be several units shown above the intersection point, all of which will produce less than the desired pressure drop at the required flow.

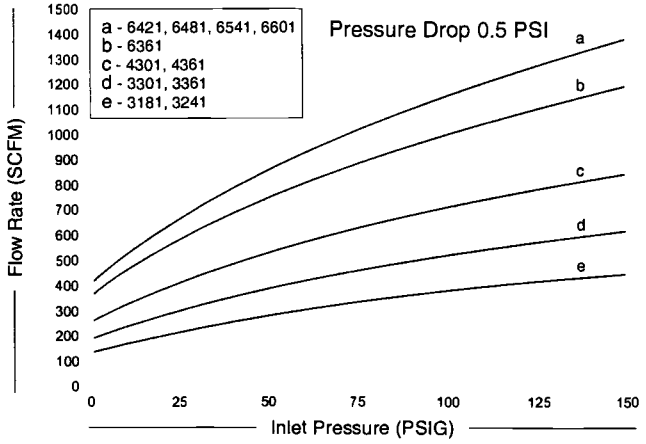
Example: Application 3 Sparge air compressor

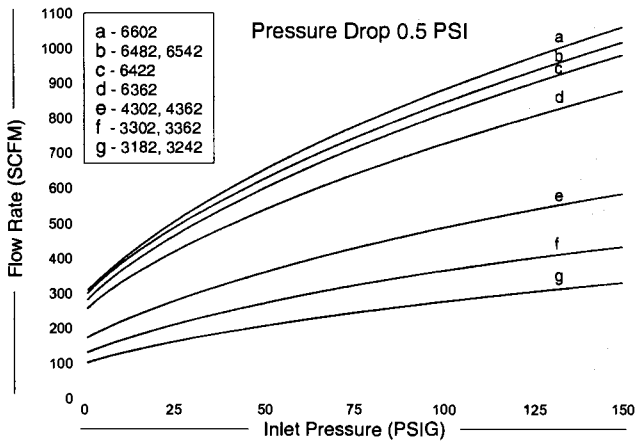
Flow = 76 SCFM
Operating pressure = 2 PSIG
Initial selection from graph page 7 = ACA-3302 or ACA-4361
Desired pressure drop = 5" H2O or less. (USE the "Pressure Drop 5" H20" curves page 12)
From the pressure drop graph, page 12. Acceptable choices - ACA-3302 is on the line, ACA-4361 is well below the line. Either unit could fulfill the requirement, however, other considerations should be made prior to selection such as unit physical size, cost, availability, and port size.

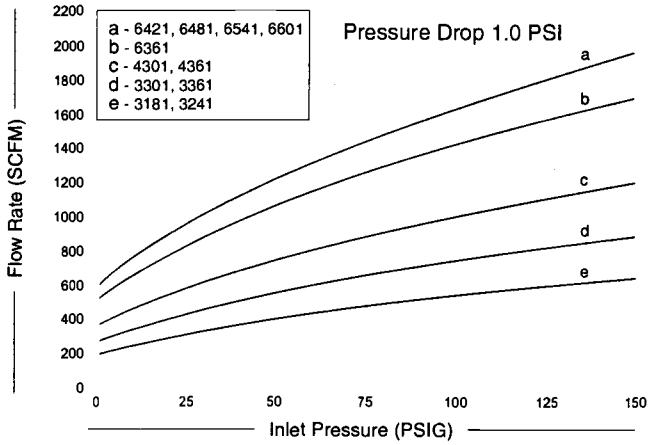
PRESSURE DROP GRAPHS (selection instructions see page 11)

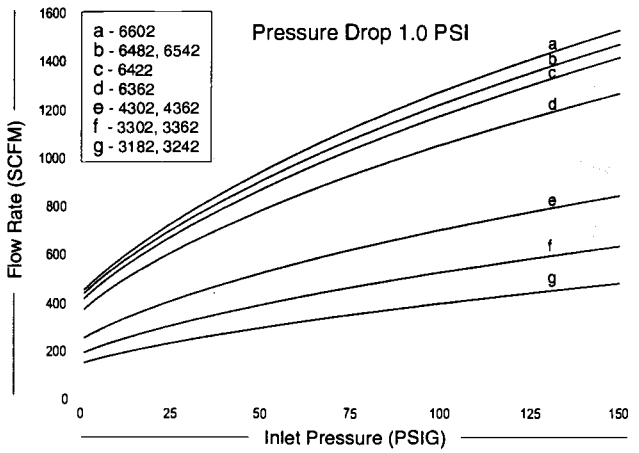


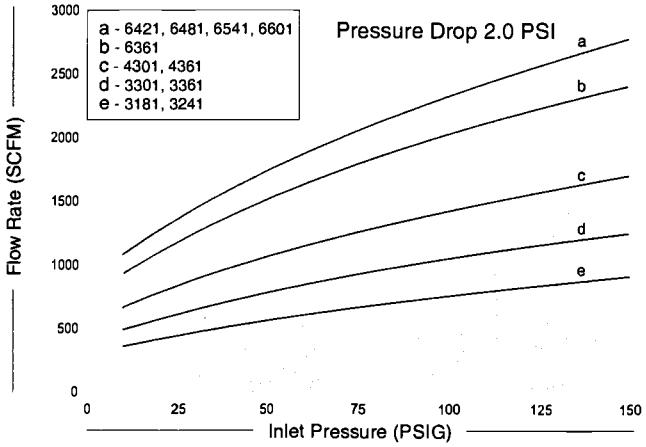


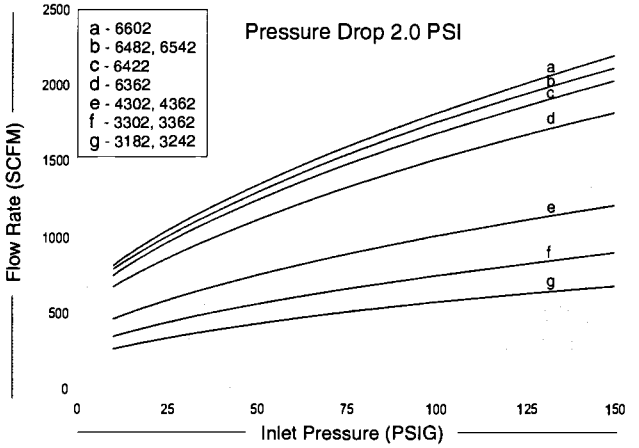






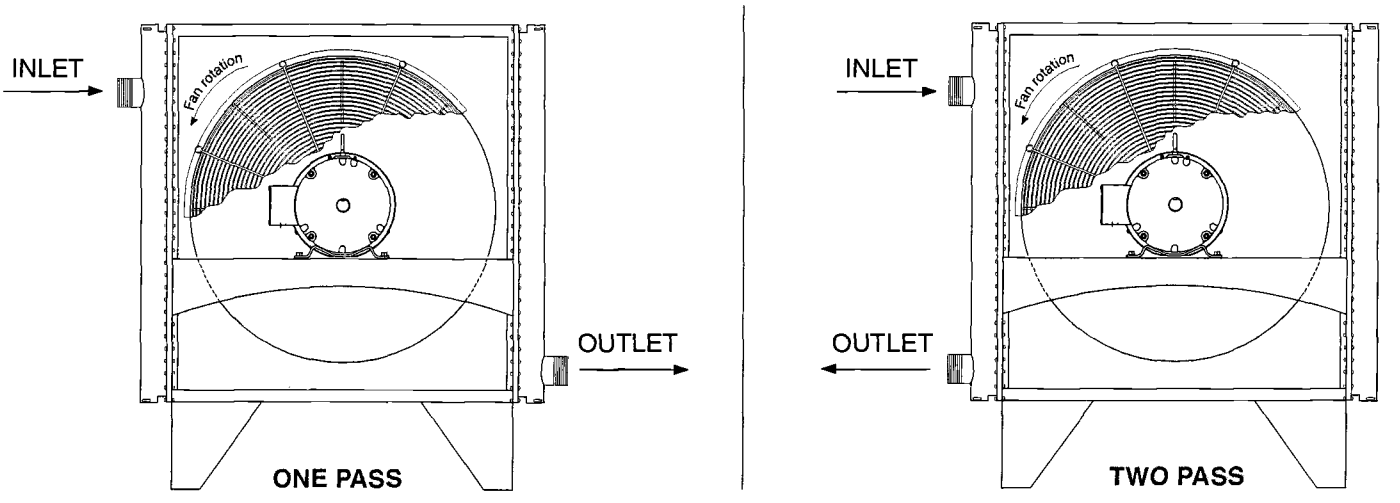






INSTALLATION & MAINTENANCE

PIPING HOOK UP



Receiving:

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

b) When handling the ACA heat exchanger, special care should be taken to avoid damage to the core and fan. All units are shipped with wood skids for easy forklift handling

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warrantee it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

Installation:

a) American Industrial recommends that the equipment supplied should be installed by qualified personal who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any ACA series cooler. If the system pressure or temperature does not fall within the parameters on ACA rating tag located on the heat exchanger, contact our factory prior to installation or operation.

b) In order for the heat exchanger to properly function, installation should be made with minimum airflow obstruction distance of not less than twenty (20) inches on both fan intake and exiting side of the heat exchanger.

c) Process piping should be as indicated above with the process flow entering into the upper port and exiting out the lower port (see illustration). This configuration will allow for condensate moisture to drain completely from the equipment. It is recommended that an air separator or automatic drip leg be applied to the outlet side of the heat exchanger to trap any moisture that develops.

d) Flow line sizes should be sized to handle the appropriate flow to meet the system pressure drop requirements. If the nozzle size of the heat exchanger is smaller than the process line size an increased pressure differential at the heat exchanger may occur.

e) ACA series coolers are produced with both brazed ACA-3181 through ACA-4362, and serviceable core® ACA-6301 through ACA-6602 style coils. A brazed construction coil does not allow internal tube access. A serviceable core® will allow full accessibility to the internal tubes for cleaning and maintenance. ACA series coolers are rated for 150 PSIG working pressure, and a 400°f working temperature.

f) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

g) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor infor-

INSTALLATION & MAINTENANCE

mation plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction normally counter clockwise from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components. Fan blades should be rechecked for tightness after the first 100 hours of operation.

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, load adapters, etc... are not manufactured by American Industrial maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture (Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used). A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.

c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

d) Most low horsepower electric motors do not require any additional lubrication. However, larger motors must be lubricated with good quality grease as specified by the manufacture at least once every 6-9 months or as directed by the manufacture. T.E.F.C. air ventilation slots should be inspected and cleaned regularly to prevent clogging and starving the motor of cooling air. To maintain the electric motor properly see the manufactures requirements and specifications.

e) Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor. Replace any damaged fan with an American industrial suggested replacement.

f) ACA heat exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

h) It is not advisable to attempt repairs to brazed joints of a brazed construction coil unless it will be done by an expert in silver solder brazing. Brazed coils are heated uniformly during the original manufacturing process to prevent weak zones from occurring. Uncontrolled reheating of the coil may result in weakening of the tube joints surrounding the repair area. In many instances brazed units that are repaired will not hold up as well to the rigors of the system as will a new coil. American Industrial will not warranty or be responsible for any repairs done by unauthorized sources. Manipulation in any way other than normal application will void the manufactures warranty.

i) Units containing a Serviceable Core® have bolted manifold covers that can be removed for cleaning or repair purposes.

Servicing Sequence

American Industrial has gone to great lengths to provide components that are repairable. If the ACA unit requires internal cleaning or attention the following steps will explain what must be done to access the internal tubes. Be sure to order gasket kits or repair parts prior to removal and disassembly to minimize down time.

a) To clean the internal tubes first remove all connection pipes from the unit.

b) Be sure the unit is drained of all water etc...

c) Place the ACA unit in an area that it can be accessed from all sides.

d) Remove the manifold cover bolts and hardware and place them into a secure place.

e) The manifold covers are tightly compressed and may need some prying to separate them from the gasket, physically remove the cover assemblies from both sides.

f) The tubes are now accessible for cleaning. We suggest a mild water-soluble degreaser be used with a brush. Tubing I.D. is .325 a plastic bristle brush on a rod will work best for cleaning the tubes. Steel brushes should be avoided since the steel is harder than the copper tubing and may heavily score the tubes if used.

g) If there are any leaking tubes you may plug them be forcing a soft metal plug into the hole and tapping it tight. You may in some cases weld the leaking tube shut however, care should be taken since excessive heat may cause surrounding tube joints to loosen and leak.

h) When finished reattach the manifold covers using new gaskets, bolts, and hardware. We suggest using a torque wrench to final tighten the bolts. *For 5/16" bolts 22-23 ft.-lbs, for 3/8" bolts to 38-42 ft.-lbs.* Since bolts and hardware can physically fatigue during application we suggest new bolt kits be used when reassembling.

PARTIAL TERMS & CONDITIONS

Limited Warranty

Seller makes no warranties expressed or implied, including but not by way of limitation, any implied warranty of merchantability and any implied warranty of fitness for a particular purpose, on any order except that seller warrants title to all goods furnished by seller and except that seller warrants for a period of one year from the date mark located on the seller's identification tag that all goods described on seller's acknowledgment of purchaser's purchase order will be manufactured in accordance with the specifications, if any, set forth in said purchase order and expressly accepted in seller's acknowledgment subject to seller's standard manufacturing variations and practices. In the case of components or accessories furnished by suppliers to seller, purchaser's warranty from seller shall be limited to the warranty of the component or accessory supplier. The foregoing warranties are the sole and exclusive warranties applicable to the goods delivered under this order, and all other warranties, express or implied, including without limitation any warranty of merchantability, are hereby expressly disclaimed and negated. Without limiting the generality of the foregoing, purchaser acknowledges that seller's products are not packaged or protected for long periods of storage and thus may corrode or rust over time.

Limitation of Purchaser's Remedies; Exclusive of Damages

Purchaser's remedies with respect to any claim arising out of any order, any goods delivered pursuant to any order and expressly accepted in seller's acknowledgment, or seller's performance in connection with any order, including, without limitation, any claim arising out of any recall, defect or alleged defect in any goods or services furnished by seller, shall be limited exclusively to the right of repair or replacement of such goods or services, at seller's option. Without in any way limiting the generality of the foregoing, in no event shall seller be liable for any consequential or incidental damages, including, without limitation, any loss of anticipated profits incurred by purchaser with respect to any goods or services furnished by seller, or any damages arising from injuries to persons as a result of purchaser's or a third party's negligence. Seller's warranty does not cover failures resulting from the improper installation, mounting design or application or from corrosion. The provisions of this paragraph are a material term of this transaction.

Disputes

Seller and purchaser agree to submit any disputes regarding any order, any goods delivered pursuant to any order and expressly accepted in seller's acknowledgment, or seller's performance in connection with any order, including without limitation seller's limited warranty obligation, to mediation by an independent mediator to be mutually agreed upon by seller and purchaser. The cost of such mediation shall be borne equally by seller and purchaser. In the event such mediation does not resolve their dispute, seller and purchaser agree to submit such dispute to an independent arbitrator, to be mutually agreed upon by seller and purchaser or, otherwise, chosen by the mediator. Seller and purchaser agree that all mediation and arbitration shall be conducted in Zion, Illinois. The non-prevailing party at the arbitration shall pay the prevailing party's attorneys' fees and costs incurred in participating in the arbitration.

Governing Law

Seller and Purchaser's agreement shall be governed by and interpreted in accordance with the laws of the State of Illinois of the United States of America. Manufacture, shipment and delivery are subject to any prohibition, restriction, priority, allocation, regulation or condition imposed by or on behalf of the United States of America or any other governmental body with appropriate jurisdiction which may prevent or interfere with fulfillment of any order.

Permissible Variations

Goods shipped by Seller shall be within the limits and sizes published by Seller, subject, however, to Seller's right to ship overages or underages in accordance with Seller's standard practices and goods shipped by Seller will be subject to standard variations provided such variations are non-functional or are not material in nature.

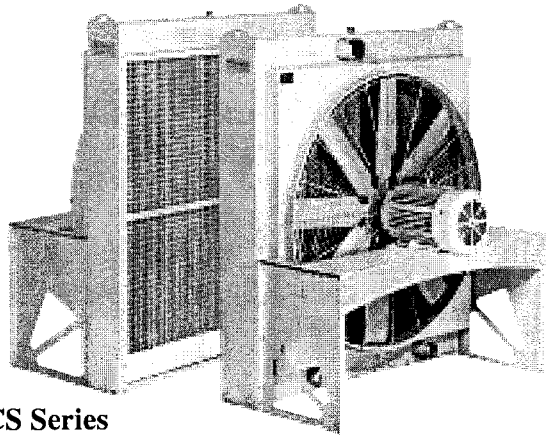
Technical Assistance and Advice

Seller's warranty shall not be enlarged and no obligation or liability shall arise out of Seller's rendering of technical assistance, technical advice facilities, service or recommendations made by Seller in connection with Purchaser's purchases of the goods hereunder. Said technical services, advice, assistance or recommendations made by Seller or any representative of Seller concerning any use or application of any goods furnished hereunder is believed to be reliable, but SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, AND THE SAME ARE HEREBY EXPRESSLY DISCLAIMED as to the same and the results to be obtained. Purchaser assumes all responsibility for loss or damage resulting from the use of any such goods.

For standard dimensional information please refer to our corresponding product brochure. For information regarding a special engineered product please contact our company. All specially engineered products specifying a 5-digit suffix will be supplied with a drawing for customer approval at the time of purchase. Additional costs may be added if requirements should change from the original specifications, or have been initially overlooked. Please be aware that "normal shipping" lead-times are estimated based upon components in stock at the time of quotation, extended shipping time up to as much as two weeks or more may be required if changes to inventory availability occur. Cancellation charges will be incurred for special order equipment.

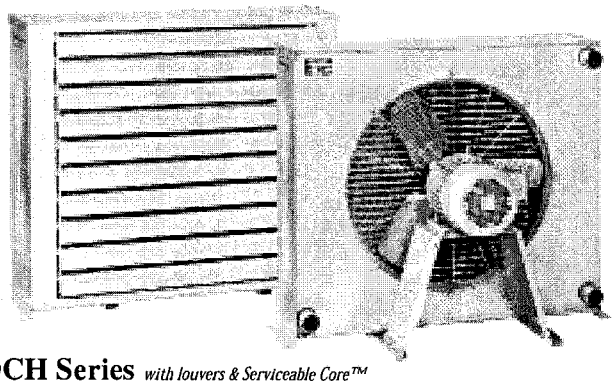
American Industrial Heat Transfer, Inc. provides a complete installation manual included with each unit sold containing a complete copy of our 3 page *"Terms and Conditions of Sale"*. If an installation manual was not received or misplaced for your equipment additional copies may be acquired. To receive a copy of American Industrial Heat Transfer, Inc. Installation Manual including *"Standard Terms and Conditions of Sale"* please refer to the following sources. 1) The American Industrial product catalog. 2) Our Internet site *www.aihti.com*, 3) Contact American Industrial directly at 1-847-731-1000.

AVAILABLE PRODUCTS



AOCS Series

• Durable desin offered in eight sized available from stock for fast delivery.

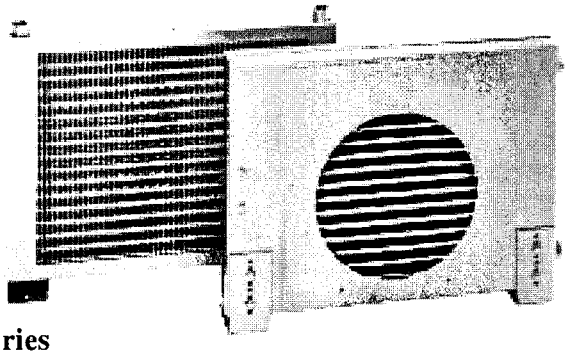


AOCH Series *with louvers & Serviceable Core™*

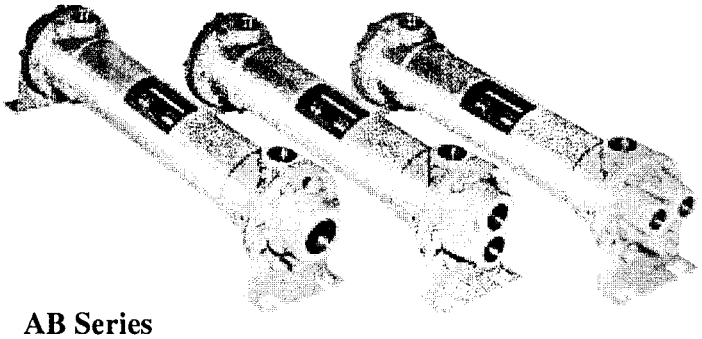
• Industrial high capacity air/oil heat exchanger available in 8 standard sizes with electric or hydraulic drive.

AC,ACHM & ACF Series

• Industrial air/oil heat exchanger available in 8 standard sizes with electric or hydraulic drive.

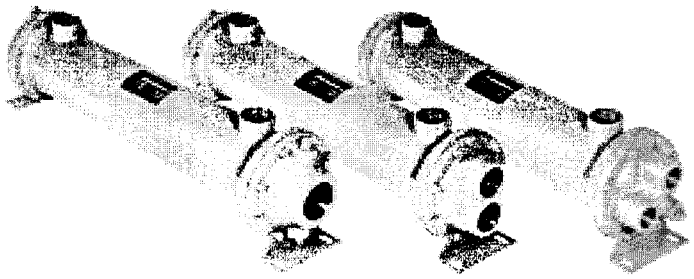


BM Series



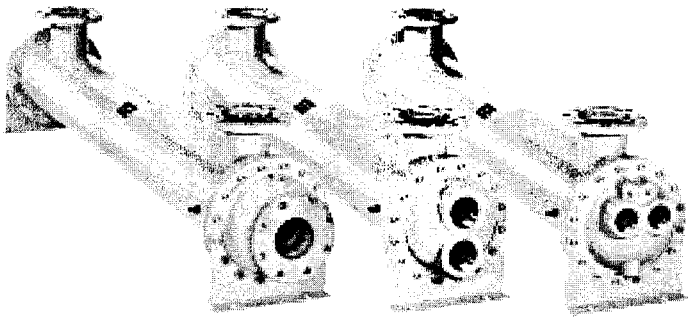
AB Series

• Variety of sizes from 2"-8" diameters, available in brass, 316L Stainless Steel.



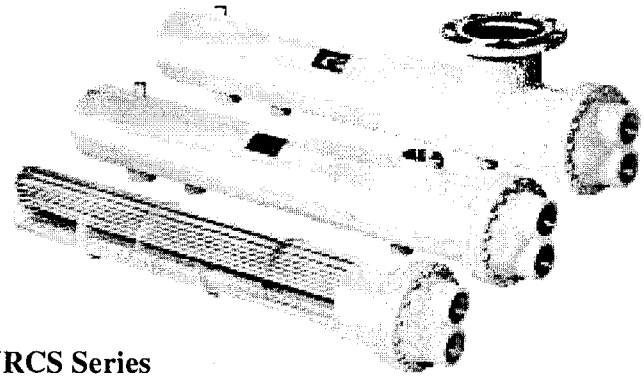
CS Series

• Variety of sizes from 2"-8" diameters, available in a wide range of materials.



AB 2000 Series

• High capacity shell & tube heat exchangers, available in sizes from 10"-32" diameters.



URCS Series

• U-tube heat exchangers for steam services with removable tubes bundle in copper, 316L SS, or 90/10 Cu Ni.

3905 Route 173 *Zion, Illinois 60099*
Telephone: (800) 338-5959 or (847) 731-1000
FAX: (847) 731-1010

American Industrial Heat Transfer Inc.

Manufacturers of Quality Heat Exchangers

BARNEBEY SUTCLIFFE
A WATERLINK COMPANY

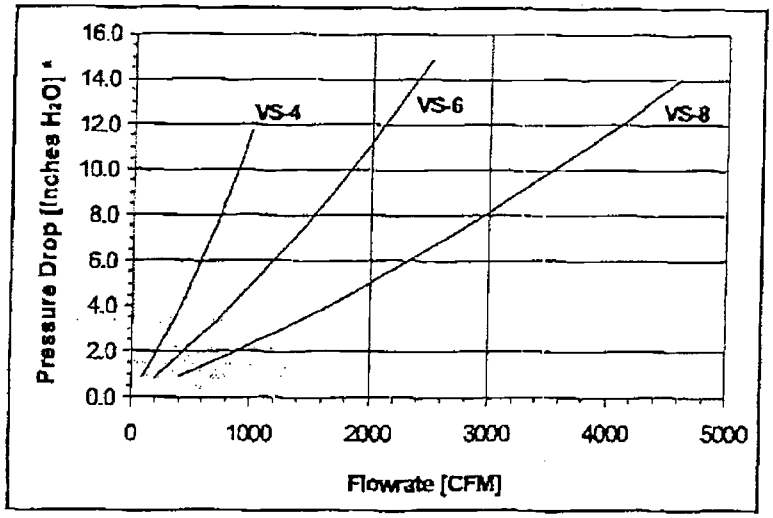
Powerful Solutions for a New Tomorrow

Protect VS Series

The Protect VS series vessels are portable, low pressure vapor adsorbers that are easily put into service. These vessels are designed to operate at a maximum pressure of 5 psi, maximum vacuum of 5" of mercury, operating temperature up to 150 °F, and hold from 2,000 to 8,000 pounds of activated carbon.

Important Features:

- Durable carbon steel construction
- Upper & lower open-air plenum area for efficient carbon usage
- Rust-prohibitive exterior epoxy urethane coating
- 16" Round inspection manway
- Condensate drain plug
- Forklift guides
- Lifting lugs to facilitate moving
- Fitting for sample port or Protect saturation indicator
- All models available to rent



* Estimated pressure drop based on 4x10 mesh carbon.

Model #	GAC		Recommended Maximum Flow Rate, cfm	Weight, lbs. (Empty / Operating)
	ft.^{3}	lbs.**		
VS-4	72	2,000	1,100	1,760 / 3,760
VS-6	180	5,000	2,500	3,340 / 8,340
VS-8	265	8,000	4,500	4,900 / 12,900

** Weight estimated based on vessel volume.

Corporate Capabilities:

Barnebey Sutcliffe has been manufacturing and servicing adsorption equipment for over 80 years. Some of our other products and services include:

- Wide variety of coal & coconut shell carbons
- Broad range of filtration media
- National network of service centers
- Carbon reactivation (hazardous & non-hazardous)
- Vessel rental
- Spent media exchange
- Technical support
- Custom-engineered systems
- ASME Code certified fabrication facility

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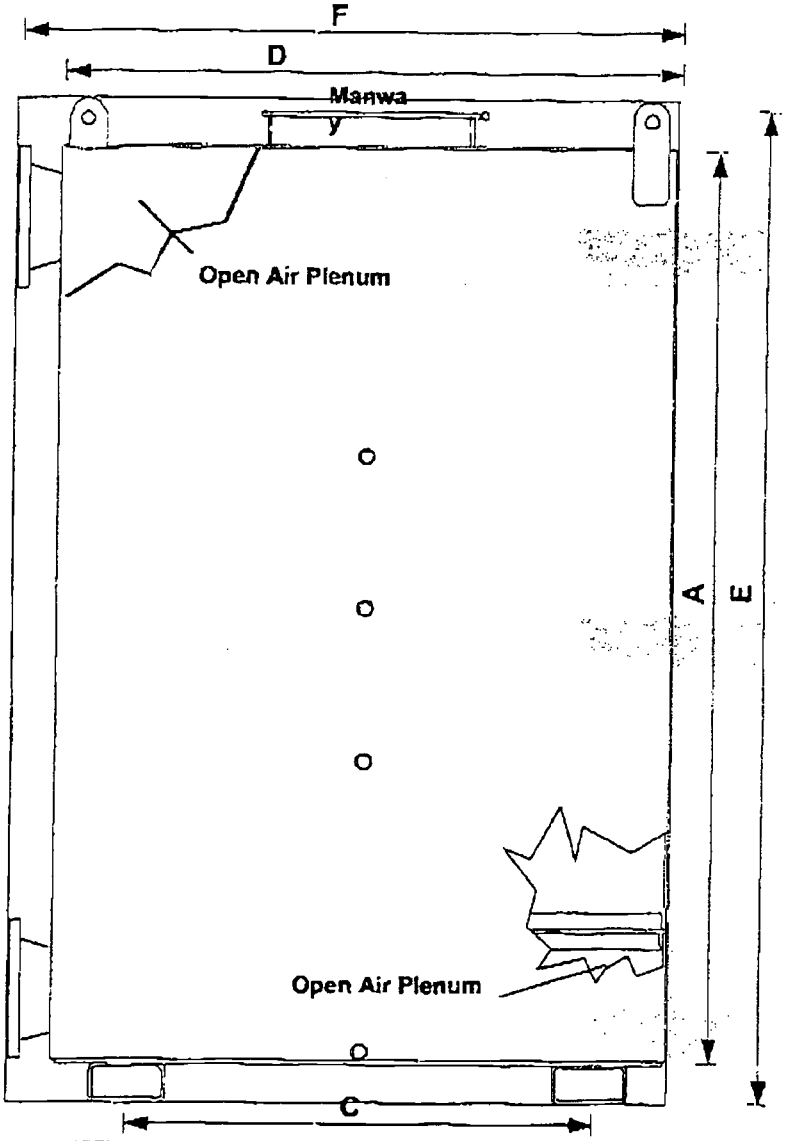
BARNEBEY SUTCLIFFE
A WATERLINK COMPANY

Powerful Solutions for a New Tomorrow



Available Options:

- Internal linings
- Camloc quick connectors
- Higher operating pressures / vacuum
- Stainless steel construction
- Pressure relief valves
- Butterfly isolation valves
- Carbon saturation indicators

To discuss your application needs, call us at one of our regional offices or at

1-800-866-2272

www.bscarbons.com

Model	Cross-Sectional Area, ft^2	Side Shell A	Inlet / Outlet B	Forklift Guides C	Overall Width D	Overall Height E	Overall Length F
VS-4	16	72"	6" 150# flg	36"	49" ±	79" ±	52" ±
VS-6	36	96"	8" 150# flg	48"	73" ±	103" ±	77" ±
VS-8	64	96"	12" 150# flg	48"	97" ±	103" ±	101" ±

Due to the ongoing improvement of our products, we reserve the right to change system specifications and performance criteria without notification. Warning: Some compounds and/or high concentrations can lead to heat buildup in GAC and potential bed fire. Contact BSC for information.

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WATERLINK
Barnebey Sutcliffe

PRODUCT INFORMATION

Activated Carbon Type 207A 4x6

Coal Base Activated Carbon

Type 207A is designed for general purpose gas-phase applications. It is manufactured from specific grades of bituminous coal by high-temperature steam activation.

Standard Specifications:	**Procedure**			
Particle Size	ASTM D-2862	4x6		
On 4	ASTM D-2862	5	% w/w	Maximum
Through 6	ASTM D-2862	8	% w/w	Maximum
Carbon Tetrachloride Activity Level	ASTM D-3467	60	% w/w	Minimum
Moisture Content	ASTM D-2867	5	% w/w	Maximum

Typical Properties:			
Ball Pan Hardness	ASTM D-3802	90	%
Apparent Density	ASTM D-2854	0.45	g/cm^3
Ash Content	ASTM D-2866	14	% w/w

Packaging:

- 50 pound bags
- 55 gallons drum
- Bulk tanker
- 15 gallon drum
- 1,000 pounds bulk sacks
- 375 pounds bulk sacks

Notes:

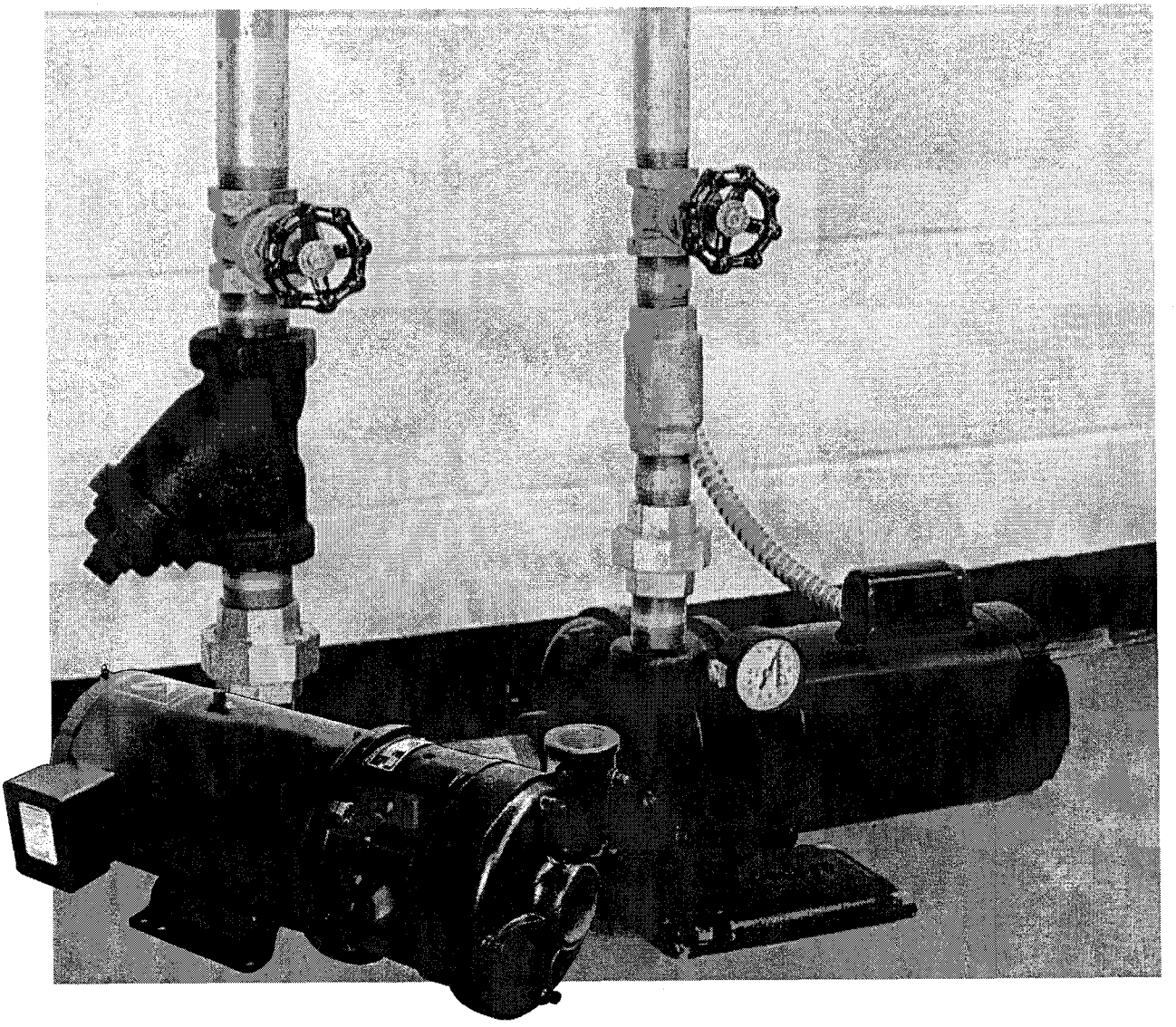
- Unless otherwise specified, particle size distribution will be 5% maximum on the top screen and 5% maximum through the bottom screen.
- An MSDS is available for all BSC activated carbon products.
- If the moisture exceeds the referenced value, BSC weight adjusts to the referenced value.

P.O. BOX 2526 Columbus, OH 43216 800-886-2272 614-258-9501 Fax: 614-258-3464
E-Mail: activated_carbon@waterlink.com www.bscarbons.com www.waterlink.com

GRUNDFOS
PRODUCT GUIDE

HS

Horizontal single-stage end-suction pumps
60 Hz



BE›THINK›INNOVATE›

GRUNDFOS

General data

Applications

The HS range of compact, horizontal, centrifugal pumps is designed for small domestic and industrial water supply systems.

Applications include:

- Liquid transfer:

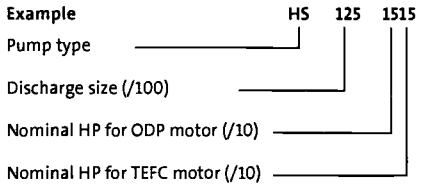
  Transfer and circulation of liquids within light industry and farming.
- Pressure boosting
- Air conditioning
- Domestic water supply
- Water fountains
- Cooling systems
- Air-conditioning systems
- Light irrigation

In addition to this, the HS range is suitable for incorporation in specialized OEM equipment.

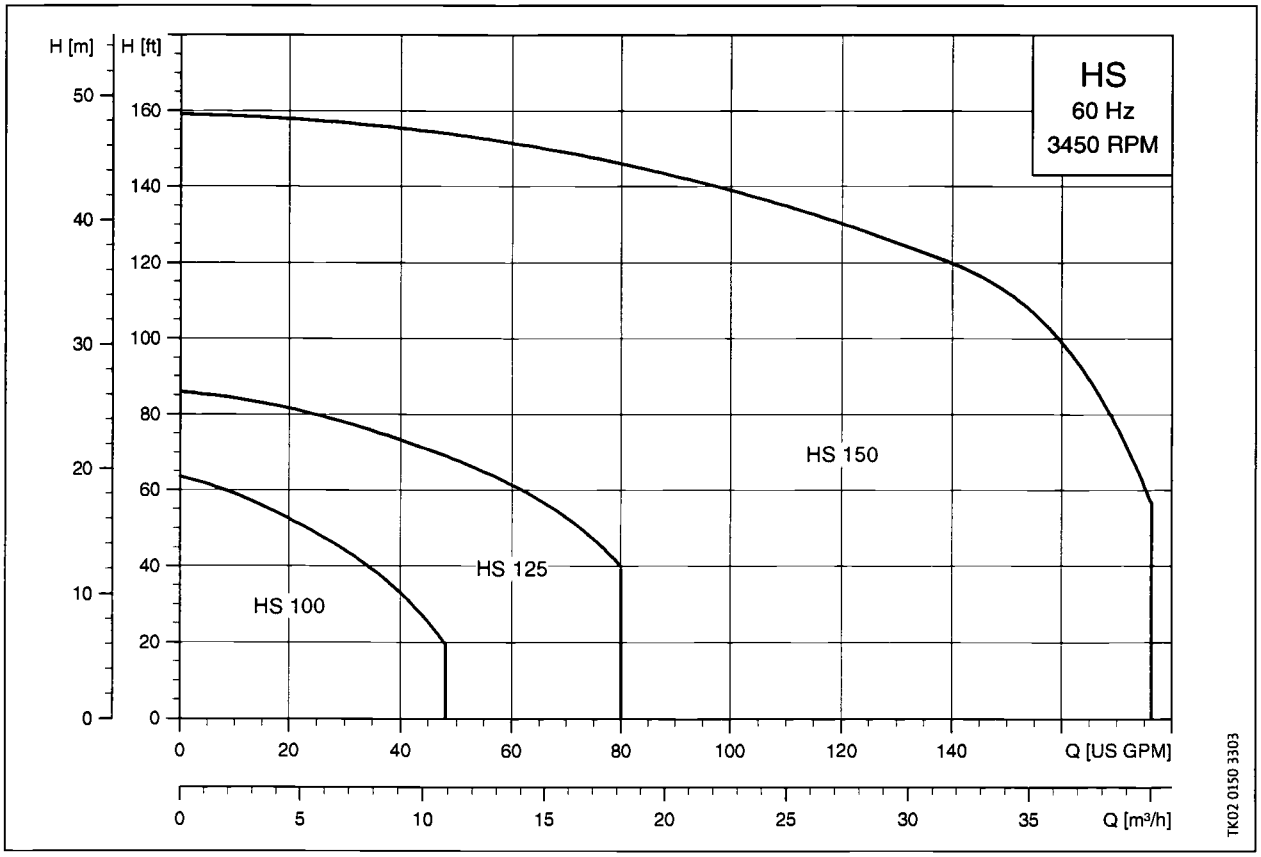
(OEM = Original Equipment Manufacturer)

Type key

HS



Performance range, HS



General data

Pumped liquids

Thin, clean, non-aggressive and non-explosive liquids without solid particles or fibers.

Operating conditions

Liquid temp.:	-5°F to +180°F (-20°C to +82°C) continuous
	-5°F to +211°F (-20°C to +99°C) intermittent
Max. ambient temp.:	+104°F (+40°C)
Max. operating press.:	125 psi (8.6 bar)
Minimum inlet press.:	According to the NPSHR curve plus a safety margin of 3 ft.
Maximum inlet press.:	Limited by maximum operating pressure.

Motor

The pump is fitted with a heavy-duty, Grundfos-specified motor.

Electrical data

Mounting designation	NEMA
Insulation class	F
Efficiency class	Standard Efficiency EPAct - on request High Efficiency - on request
Enclosure class	ODP - Open Drip Proof TEFC - Totally Enclosed Fan Cooled
60 Hz Standard voltages	1 x 115/208-230V 3 x 208-230/460V
Approvals	Motors are rated.

Single-phase motors have built-in thermal overload protection. Three-phase motors must be connected to a motor starter according to local regulations.

Direction of rotation: Clockwise from motor end.

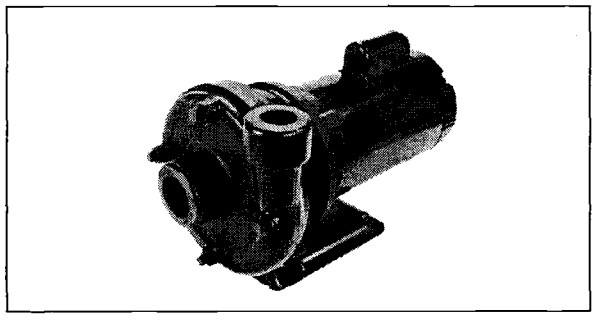
Pump

The HS pumps are non-self-priming, single-stage, horizontal centrifugal pumps with mechanical shaft seal and close coupled pump/motor shaft. The pumps have an axial suction port and radial discharge port and are mounted on a base plate.

Buna-N O-rings are standard.

For pipe connections see table below.

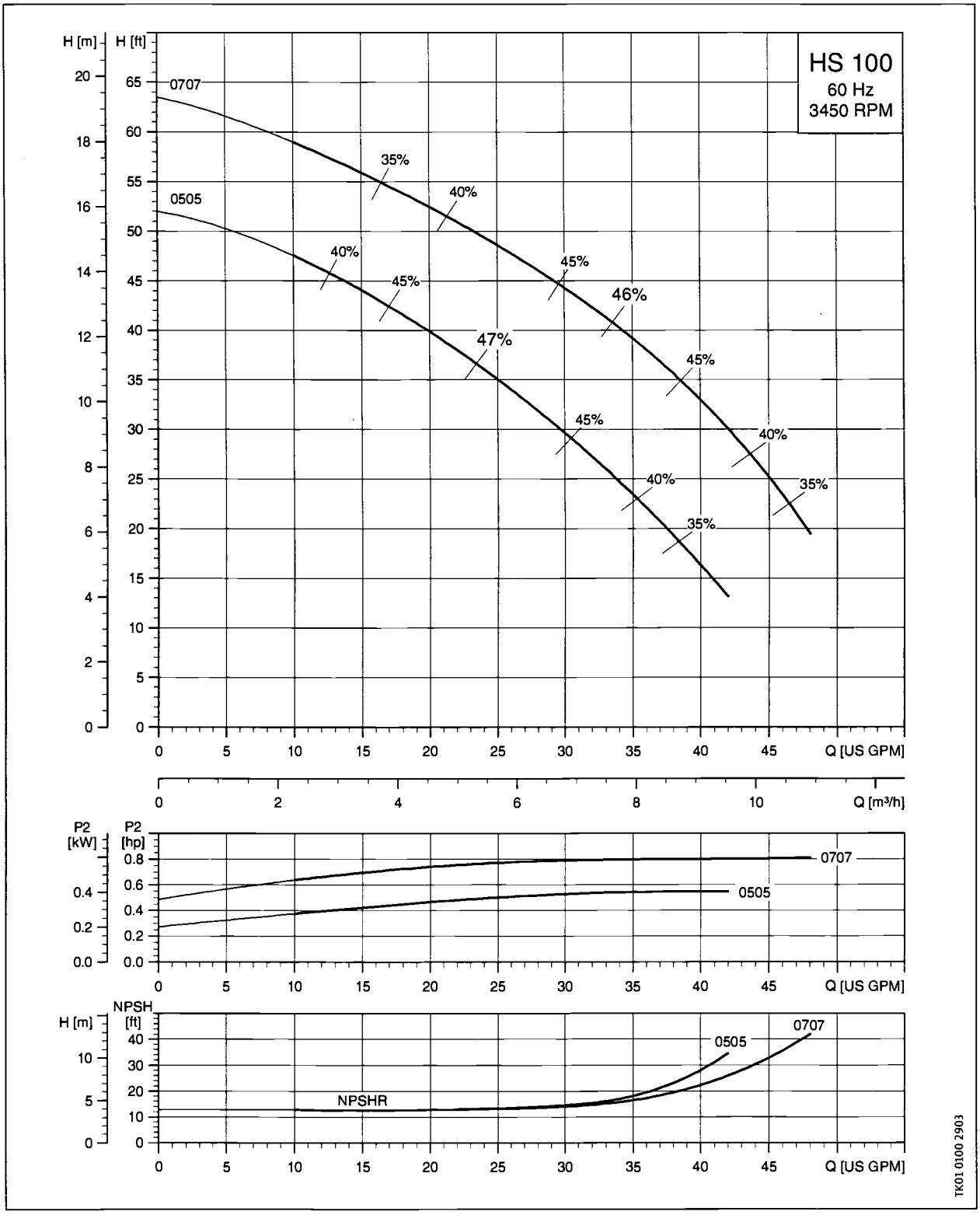
Connections	HS 100	HS 125	HS 150
Axial suction port	1 1/4" NPT	1 1/2" NPT	2" NPT
Radial discharge port	1" NPT	1 1/4" NPT	1 1/2" NPT



Materials, HS

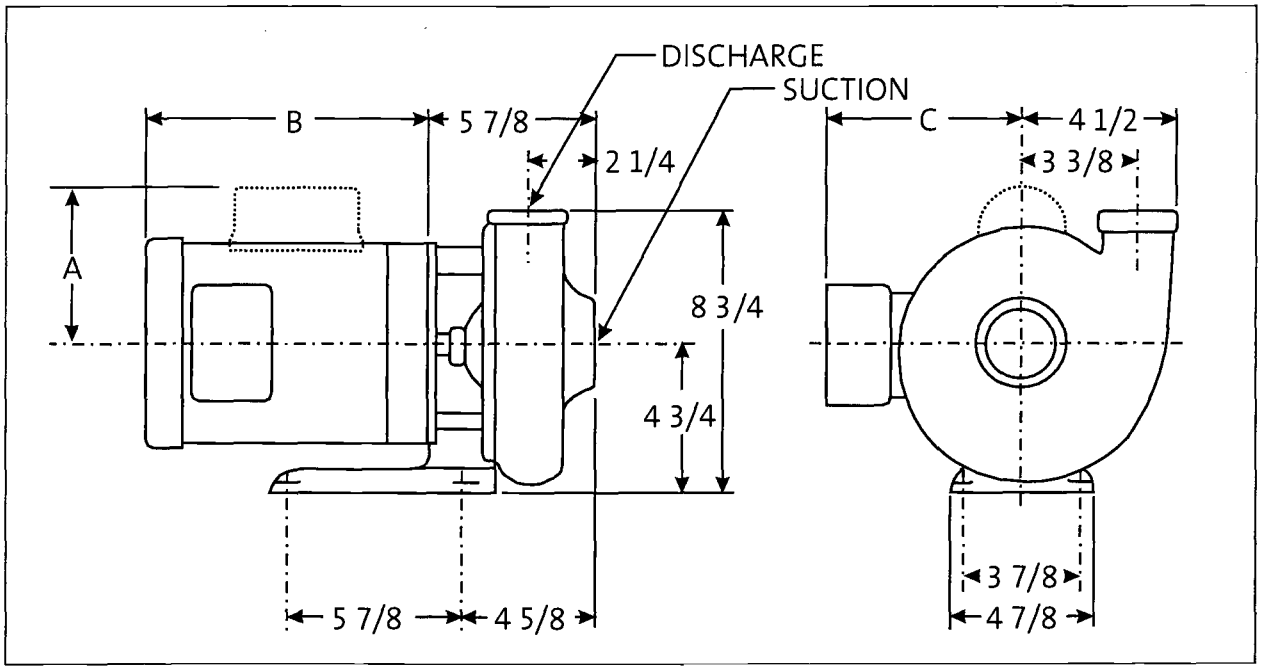
Description		Material
Pump housing, motor stool, base plate		Cast iron
Impeller		Brass
Pump shaft	HS 100, HS 125	Brass
	HS 150	AISI 416 SS
Shaft seal		Carbon/ceramic with Buna-N elastomer and stainless steel parts (FKM elastomers optional)

Performance curves



Technical data

Dimensional sketch, HS 100



Dimensions, HS 100

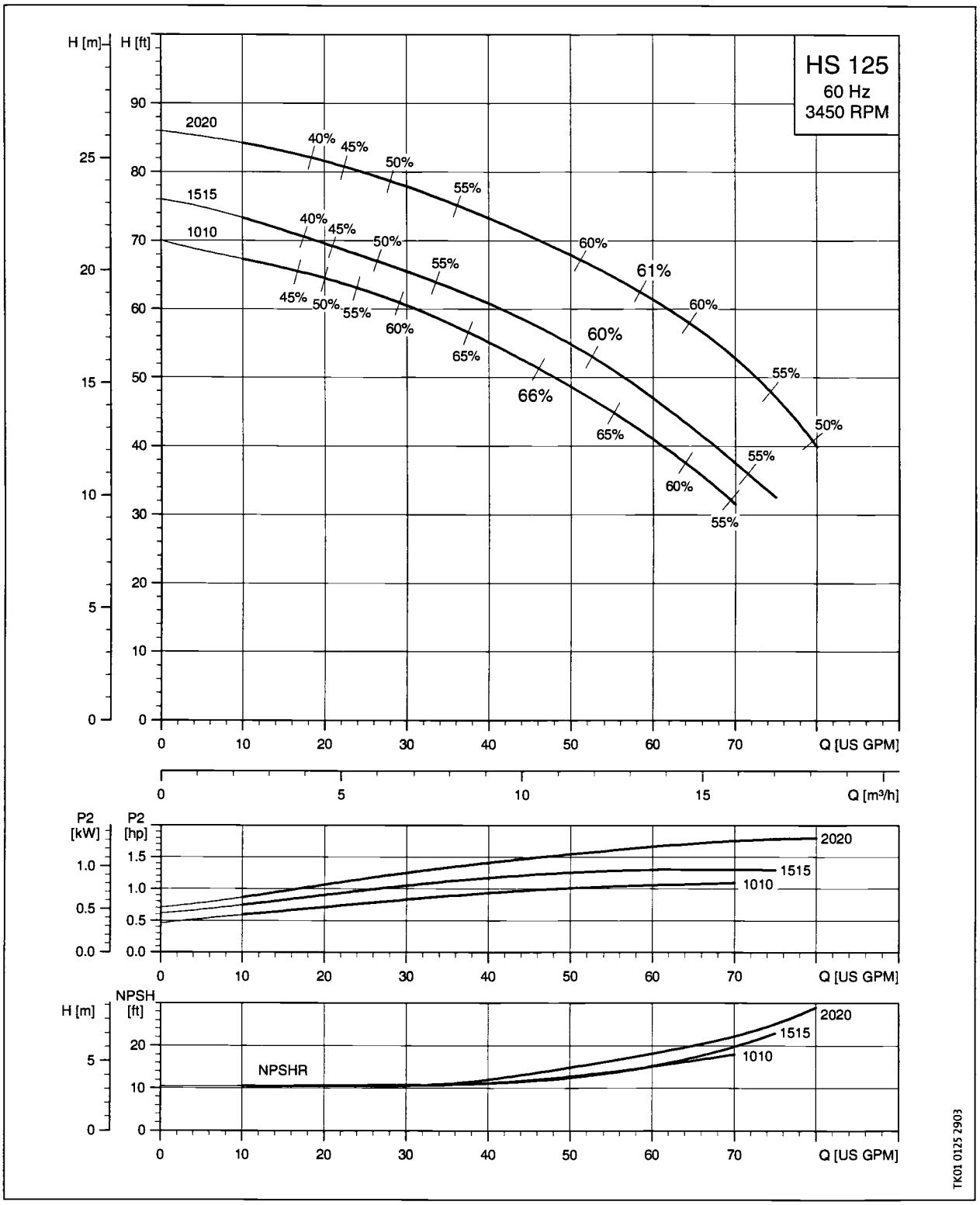
Pump type	HP	PH	NEMA Frame Size	Suc. Size [in]	Dis. Size [in]	Open drip proof (ODP) motor				Totally enclosed fan cooled (TEFC) motor				Ship vol. [ft³]
						A [in]	B [in]	C [in]	Ship wt. [lbs]	A [in]	B [in]	C [in]	Ship wt. [lbs]	
HS 100 0505	1/2	1	56C	1 1/4	1	4 3/8	9 3/8	4 3/4	47	5	9 3/8	5	53	1.7
		3				-	9 1/4	4 3/8	50	-	9 3/8	5	47	1.7
HS 100 0707	3/4	1	56C	1 1/4	1	5	11	4 7/8	50	5 1/8	10	5	57	1.7
		3				-	9 1/2	4 3/8	51	-	9 3/8	5	50	1.7

Electrical data, HS 100

Pump type	HP	PH	Voltage	Open drip proof (ODP) motor				Totally enclosed fan cooled (TEFC) motor			
				S.F.	Full load current [A]	S.F. current [A]	Start current [A]	S.F.	Full load current [A]	S.F. current [A]	Start current [A]
HS 100 0505	1/2	1	115/208-230*	1.25	7.2/4.0-3.6	8.0/4.4-4.0	30/16.6-15	1.6	7.4/4.1-3.7	9.8/5.2-4.9	39/21.6-19.5
		3	208-230/460	1.25	2.1-2.0/1.0	2.6-2.4/1.2	13.3-12/6.0	1.25	2.1-2.0/1.0	2.6-2.4/1.2	13.3-12/6.0
HS 100 0707	3/4	1	115/208-230*	1.25	9.6/5.3-4.8	11.4/6.3-5.7	56/31-28	1.25	9.6/4.8	11.4/5.7	56/28
		3	208-230/460	1.25	2.7-2.6/1.3	3.1-3.0/1.5	16.8-15.2/7.6	1.25	2.7-2.6/1.3	3.1-3.0/1.5	16.8-15.2/7.6

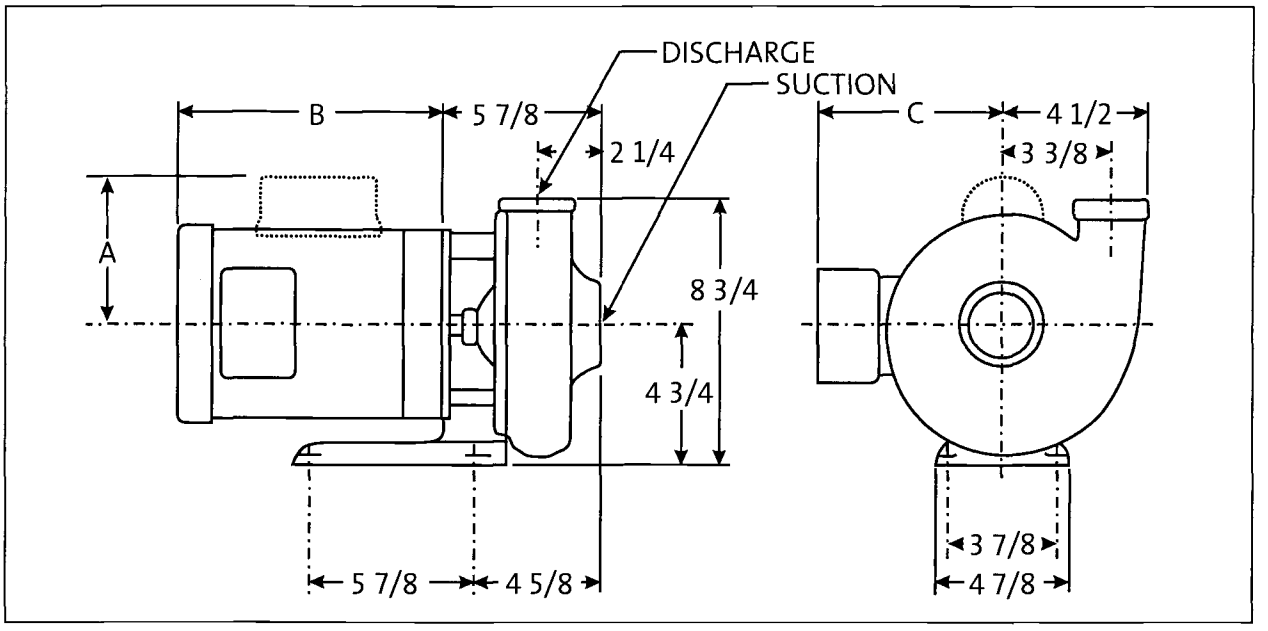
TEFC voltage is: *115/230

Performance curves



Technical data

Dimensional sketch, HS 125



Dimensions, HS 125

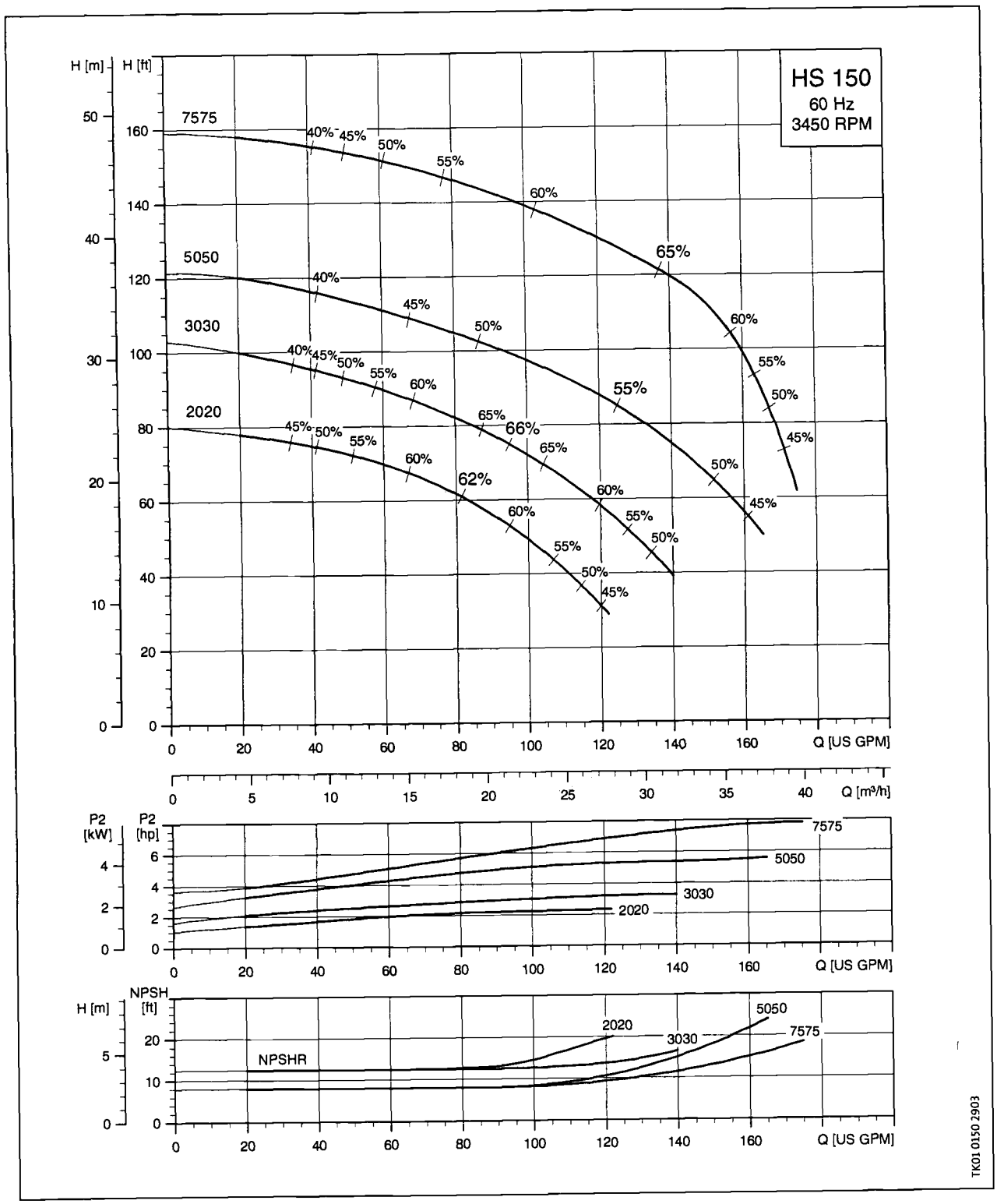
Pump type	HP	PH	NEMA Frame Size	Suc. Size [in]	Dis. Size [in]	Open drip proof (ODP) motor				Totally enclosed fan cooled (TEFC) motor				Ship vol. [ft³]
						A [in]	B [in]	C [in]	Ship wt. [lbs]	A [in]	B [in]	C [in]	Ship wt. [lbs]	
HS 125 1010	1	1	56C	1 1/2	1 1/4	5 5/8	11 1/4	5 5/8	52	5 5/8	11 1/4	5 3/4	68	1.7
		3				-	9 1/2	5 5/8	51	-	10 1/4	5 3/4	50	1.7
HS 125 1515	1 1/2	1	56C	1 1/2	1 1/4	5 1/2	11 3/4	5 5/8	54	5 5/8	11 3/4	5 3/4	70	1.7
		3				-	10 3/4	5 5/8	55	-	10 3/4	5 3/4	57	1.7
HS 125 2020	2	1	56C	1 1/2	1 1/4	5 1/2	11 3/4	5 5/8	37	5 5/8	12 5/8	5 3/4	77	1.7
		3				-	10 3/4	5 5/8	66	-	11 3/4	5 3/4	66	1.7

Electrical data, HS 125

Pump type	HP	PH	Voltage	Open drip proof (ODP) motor				Totally enclosed fan cooled (TEFC) motor			
				S.F.	Full load current [A]	S.F. current [A]	Start current [A]	S.F.	Full load current [A]	S.F. current [A]	Start current [A]
HS 125 1010	1	1	115/208-230	1.4	10/5.5-5.0	15/8.0-7.5	85/47-42.5	1.25	12/6.0	14.4/7.2	77/38.5
		3	208-230/460	1.25	3.4-3.2/1.6	3.8-3.6/1.8	19.5-17.6/8.9	1.25	3.4-3.2/1.6	3.8-3.6/1.8	19.7-17.8/8.9
HS 125 1515	1 1/2	1	115/208-230*	1.15	18/10-9	19.7/10.7-9.7	121/66.8-60.4	1.3	17/9.5-8.6	20.4/11.3-10.2	106/58.6-53
		3	208-230/460	1.15	5.0-4.6/2.3	5.4-5.0/2.5	35.4-32/16	1.15	5.0-4.6/2.3	5.4-5.2/2.6	35.4-32/16
HS 125 2020	2	1	115/208-230*	1.15	24/13.3-12	27.6/15.3-13.8	160/88.5-80	1.15	23/11.5	25.4/12.7	156/78
		3	208-230/460	1.15	5.9-5.6/2.8	6.7-6.4/3.2	40.9-37/18.5	1.15	5.7-5.4/2.7	6.5-6.2/3.1	38.7-35/17.5

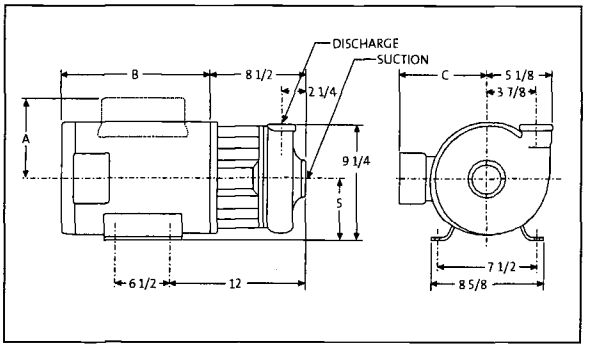
TEFC voltage is: *115/230

Performance curves

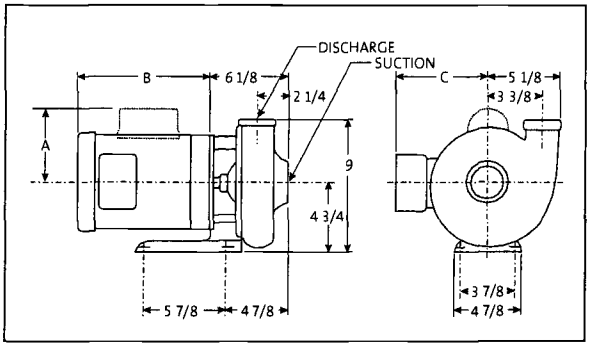


Technical data

Dimensional sketch, HS 150 Large



Dimensional sketch, HS 150 Small



Dimensions, HS 150

Pump type	HP	PH	NEMA Frame Size	Suc. Size [in]	Dis. Size [in]	Open drip proof (ODP) motor				Totally enclosed fan cooled (TEFC) motor				Ship vol. [ft³]
						A [in]	B [in]	C [in]	Ship wt. [lbs]	A [in]	B [in]	C [in]	Ship wt. [lbs]	
HS 150 2020	2	1	56C	2	1 1/2	5 1/2	11 3/4	5 5/8	37	5 5/8	12 5/8	5 3/4	83	1.7
		3				-	10 3/4	5 5/8	66	-	11 3/4	5 3/4	72	1.7
HS 150 3030	3	1	56C	2	1 1/2	5 1/2	12 1/8	5 1/4	85	6 1/4	13	6	103	1.7
		3				-	11 1/4	5 1/8	78	-	12 1/8	5 3/4	81	1.7
HS 150 5050	5	1	184TC	2	1 1/2	6 5/8	12 1/4	6 3/4	116	6 5/8	15 1/4	6	130	1.7
		3	182TC			-	12 1/4	6 3/4	113	-	13 3/4	6 7/8	115	1.7
HS 150 7575	7 1/2	3	184TC	2	1 1/2	-	12 1/4	6 3/4	118	-	15 1/4	6 7/8	129	1.7

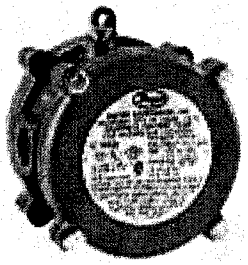
Electrical data, HS 150

Pump type	HP	PH	Voltage	Open drip proof (ODP) motor				Totally enclosed fan cooled (TEFC) motor			
				S.F.	Full load current [A]	S.F. current [A]	Start current [A]	S.F.	Full load current [A]	S.F. current [A]	Start current [A]
HS 150 2020	2	1	115/208-230*	1.15	24/13.3-12	27.6/15.3-13.8	160/88.5-80	1.15	23/11.5	25.4/12.7	156/78
		3	208-230/460	1.15	5.9-5.6/2.8	6.7-6.4/3.2	40.9-37/18.5	1.15	5.7-5.4/2.7	6.5-6.2/3.1	38.7-35/17.5
HS 150 3030	3	1	230**	1.15	13	14.8	108	1.15	30/16.5-15	32.2/17.8-16.1	172/95.1-86
		3	208-230/460	1.15	8.4-8.0/4.0	9.2-8.7/4.4	66.3-60/30	1.15	7.8-7.4/3.7	9.5-8.6/4.3	59.7-54/27
HS 150 5050	5	1	208-230***	1.15	24-23	30.1-27.2	138-125	1.15	21	24.2	124
		3	208-230/430	1.15	13.1-11.5/5.7	15.3-13.8/6.9	106-96/48	1.15	13-12/6.0	14.8-13.4/6.7	123.8-112/56
HS 150 7575	7 1/2	3	208-230/460	1.15	19-18/9.0	22.3-20.2/ 10.1	168-152/76	1.15	18.5-17.4/8.7	21.7-19.6/9.8	207.9-188/ 94

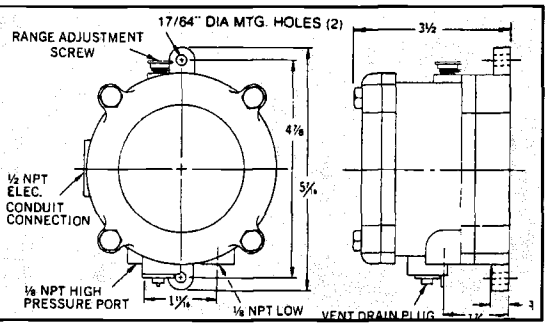
TEFC voltage is: *115/230, **115/208-230, ***230

Series 1950 Explosion-Proof Differential Pressure Switches

Compact, Low cost, Explosion-proof and Weatherproof.



Patent No. 3,566,060



Model 1950 Explosion-Proof Differential Pressure Switch combines the best features of the popular Dwyer series 1900 with an integral explosion-proof and weather-proof housing, making it an exceptional value for either application. It is C.E., U.L. and C.S.A. Listed, F.M. approved for use in Class I Groups C and D, Class II Groups E, F, and G and Class III hazardous atmospheres (NEMA 7 & 9). Weather-proof features include a drain plug and O-ring seal in cover. Electrical connections are easily made by removing front cover. For convenience the set point adjustment screw is located on the outside of the housing. Twelve models offer set points from .03 to 20" (.8 to 508 mm) w.c. and from .5 to 50 psi (3.4 to 345 kPa). The unit is very light and compact – about half the weight and bulk of other explosion-proof or weather-proof switches with separate enclosures.

PHYSICAL DATA

Temperature Limits: -40°F to 140°F (-40°C to 60°C). 0°F to 140°F (-18°C to 60°C) for 1950P-8, 15, 25, and 50 -30°F to 130°F (34°C to 54°C) for 1950-02
Maximum Surge Pressure: 1950-10 psi (.7 bar), 1950P - 50 psi (3.4 bar) 1950P-50 only - 90 psi (6.2 bar)
Rated Pressure: 1950 - 45" (.1 bar) w.c., 1950P - 35 psi (2.4 bar), 1950P-50 only - 70 psi (4.8 bar)
Pressure Connection: 1/8" NPT(F).
Electrical Rating: 15 amps, 125, 250, 480 volts, 60 Hz. AC. Resistive1/8" H.P. @125 volts,1/4" H.P. @ 250 volts, 60 Hz. A.C.
Wiring Connections: 3 screw type; common, norm. open and norm. closed.
Conduit Connection: 1/2" NPT(F).
Set Point Adjustment: Screw type on top of housing. Field adjustable.
Housing: Anodized cast aluminum.
Diaphragm: Molded fluorosilicone rubber. 02 model, silicone on nylon.
Calibration Spring: Stainless steel.
Installation: Mount with diaphragm in vertical position.
Weight: 3 1/4 lbs. (1.5 kg) 02 model, 4 lbs., 7 oz. (2 kg)

SERIES 1950 SWITCHES — STOCKED MODELS, OPERATING RANGES AND DEAD BANDS

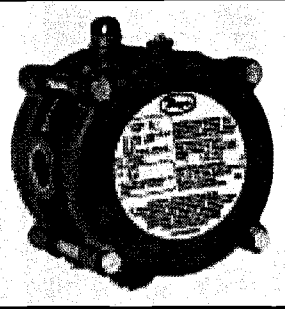
Model Number	Range, Inches W.C.	Approximate Dead Band at	
		Min. Set Point	Max. Set Point
1950-02	.03 to .10	.025	.05
1950-00	.07 to .15	.04	.05
1950-0	.15 to .50	.10	.15
1950-1	.4 to 1.6	.15	.20
1950-5	1.4 to 5.5	.30	.40
1950-10	3 to 11	.40	.50
1950-20	4 to 20	.40	.60

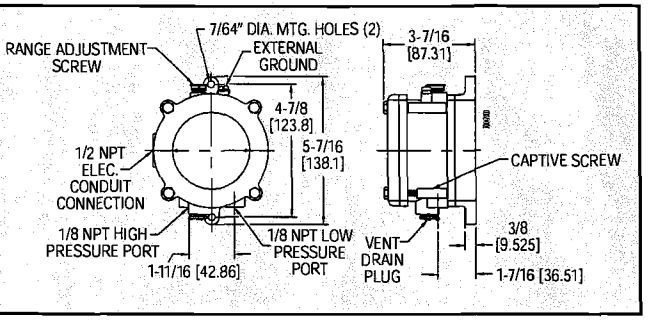
Model Number	Range, PSID	Approximate Dead Band at	
		Min. Set Point	Max. Set Point
1950P-2	0.5 to 2	.3	.3
1950P-8	1.5 to 8	1.0	1.0
1950P-15	3 to 15	.9	.9
1950P-25	4 to 25	.7	.7
1950P-50	15 to 50	1.0	1.5

CAUTION: For use only with air or compatible gases. Applications with hazardous atmospheres and a single positive pressure may require special venting.

Model 1950G Explosion-Proof Differential Pressure Switch

Explosion-Proof, Weatherproof, Compatible with Natural Gases





The Model 1950G Explosion-Proof Switch combines the best features of the popular Dwyer Series 1950 Pressure Switch with the benefit of natural gas compatability.

Units are rain-tight for outdoor installations, and are U.L. listed for use in Class I, Groups A, B, C, & D; Class II, Groups E, F, & G and Class III atmospheres, CENELEC approved for EExd IIB & Hydrogen T6, and CSA & FM approved for Class I, Div 1, Groups B, C, D; Class II, Div 1, Groups E, F, G and Class III atmospheres. The 1950G is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.

Easy access to the SPDT relay and power supply terminals is provided by removing the top plate of the aluminum housing. A supply voltage of 120 or 240 VAC is required. A captive screw allows the cover to swing aside while remaining attached to the unit. Adjustment to the set point of the switch can be made without disassembly of the housing.

PHYSICAL DATA

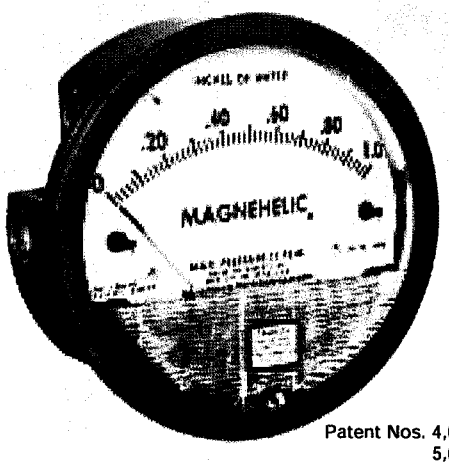
Temperature Limits: 0°F to 140°F (17.7° to 60°C). Note: Setpoint drift may occur with ambient temperature changes.
Rated Pressure: 45 IN. w.c.
Maximum Surge Pressure: 10 psi.
Pressure Connections: 1/8" NPT(F).
Electrical Rating: 10A, 120/240 VAC, 28 VDC Resistive 50mA, 125 VDC.
Supply Voltage: 120/240 VAC.
Wiring Connections: Internal Terminal Block.
Conduit Connections: 1/2" NPT(F).
Set Point Adjustment: Screw type on top of housing. Field adjustable.
Housing: Anodized cast aluminum.
Diaphragm: Buna-N. **Weight:** 3¼ lbs.
Calibration Spring: Stainless Steel.
Installation: Mount with diaphragm in vertical position.
Response Time: Switch response time may be as much as 10-25 seconds where applied pressures are near set point.

STOCKED MODELS

Model Number	Range, Inches W.C.	Approximate Dead Band at	
		Min. Set Point	Max. Set Point
1950G-00	.07 to .15	.04	.06
1950G-0	.15 to .50	.06	.11
1950G-1	.4 to 1.6	.11	.29
1950G-5	1.4 to 5.5	.4	.9
1950G-10	3 to 11	.9	1.8
1950G-20	4 to 20	1.2	3.0

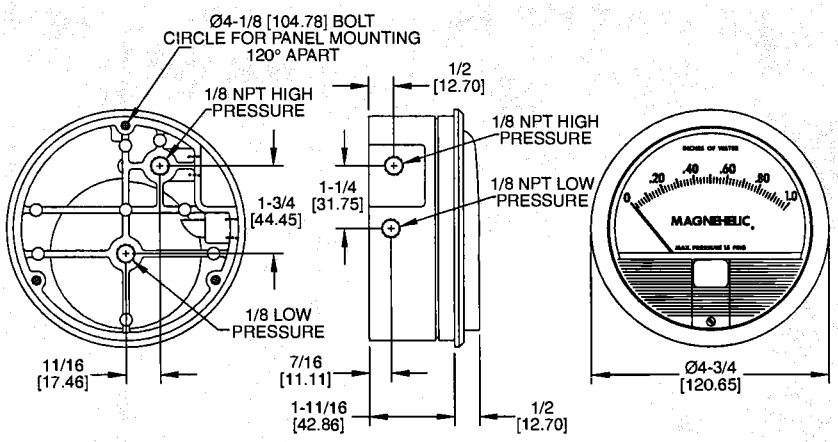
Series 2000 Magnehelic® Differential Pressure Gages

Indicate positive, negative or differential. Accurate within 2%.



Patent Nos. 4,030,365
5,012,678

Standard Magnehelic® Pressure Gage has a large, easy-to-read 4" dial.



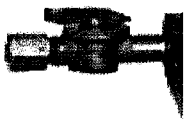
Dimensions, Standard Series 2000 Magnehelic® Pressure Gages. (Slightly different on medium and high pressure models)

Select the Dwyer Magnehelic® gage for high accuracy – guaranteed within 2% of full scale – and for the wide choice of 81 ranges available to suit your needs precisely. Using Dwyer's simple, frictionless Magnehelic® movement, it quickly indicates low air or non-corrosive gas pressures – either positive, negative (vacuum) or differential. The design resists shock, vibration and over-pressures. No manometer fluid to evaporate, freeze or cause toxic or leveling problems. It's inexpensive, too.

Widely used to measure fan and blower pressures, filter resistance, air velocity, furnace draft, pressure drop across orifice plates, liquid levels with bubbler systems and pressures in fluid amplifier or fluidic systems. It also checks gas-air ratio controls and automatic valves, and monitors blood and respiratory pressures in medical care equipment.

Flush ...Surface...or Pipe Mounted

MOUNTING. A single case size is used for most ranges of Magnehelic® gages. They can be flush or surface mounted with standard hardware supplied. With the optional A-610 Pipe Mounting Kit they may be conveniently installed on horizontal or vertical 1¼" - 2" pipe. Although calibrated for vertical position, many ranges above 1" may be used at any angle by simply re-zeroing. However, for maximum accuracy, they must be calibrated in the same position in which they are used. These characteristics make Magnehelic® gages ideal for both stationary and portable applications. A 4⁹⁄₁₆" hole is required for flush panel mounting. Complete mounting and connection fittings plus instructions are furnished with each instrument.



VENT VALVES

In applications where pressure is continuous and the Magnehelic® gage is connected by metal or plastic tubing which cannot be easily removed, we suggest using Dwyer A-310A vent valves to connect gage. Pressure can then be removed to check or re-zero the gage.

HIGH AND MEDIUM PRESSURE MODELS

Installation is similar to standard gages except that a 4¹³⁄₁₆" hole is needed for flush mounting. The medium pressure construction is rated for internal pressures up to 35 psig and the high pressure up to 80 psig. Available in all ranges. Because of larger case, will not fit in portable case. Weight 1 lb., 10 oz (Installation of the A-321 safety relief valve on standard Magnehelic® gages often provides adequate protection against infrequent overpressure.

PHYSICAL DATA

Ambient temperature range: 20° to 140°F* (–7° to 60°C).
Rated total pressure: –20" Hg. to 15 psig† (–68 kPa to 103 kPa).
Overpressure: Relief plug opens at approximately 25 psig (172 kPa).
Connections: ⅛" NPT(F) high and low pressure taps, duplicated — one pair side and one pair back.
Housing: Die cast aluminum. Case and aluminum parts iridite-dipped to withstand 168 hour salt spray test. Exterior finish is dark gray.
Accuracy: Plus or minus 2% of full scale (3% on -0 and 4% on -00 ranges), throughout range at 70°F (21°C).
Standard accessories: Two ⅛" NPT plugs for duplicate pressure taps, two ⅛" pipe thread to rubber tubing adapters and three flush mounting adapters with screws. (Mounting ring and snap ring retainer substituted for 3 adapters in MP & HP gage accessories.)
Weight: 1 lb. 2 oz. (460 g)

*Low temperature models available as special option.
†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options at lower left.

OPTIONS AND ACCESSORIES

Transparent overlays

Furnished in red and green to highlight and emphasize critical pressures.

Adjustable signal flag

Integral with plastic gage cover. Available for most ranges except those with medium or high pressure construction. Can be ordered with gage or separate

LED Setpoint Indicator

Bright red LED on right of scale shows when setpoint is reached. Field adjustable from gage face, unit operates on 12-24 VDC. Requires MP or HP style cover and bezel

Portable units

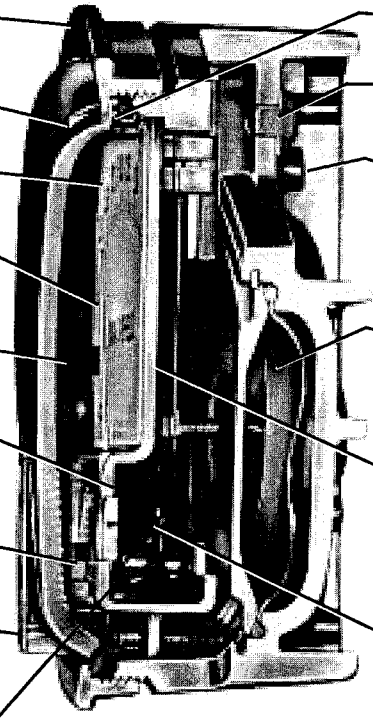
Combine carrying case with any Magnehelic® gage of standard range (not high pressure). Includes 9 ft. (2.7 m) of ⅜" I.D. rubber tubing, standhang bracket and terminal tube with holde

Air filter gage accessory package

Adapts any standard Magnehelic® for use as an air filter gage. Includes aluminum surface mounting bracket with screws, two 5 ft. (1.5 m) lengths of ¼" aluminum tubing two static pressure tips and two molded plastic vent valves, integral compression fittings on both tips and valves

Dwyer Instruments, Inc. P.O. Box 373/Michigan City, Indiana 46361/Phone 219 879-8000/Fax 219 872-9057 • U.K. Phone (01494)-461707 • Australia Phone (02) 9756-5355

Quality design and construction features



Bezel provides flange for flush mounting in panel.

Clear plastic face is highly resistant to breakage. Provides undistorted viewing of pointer and scale.

Precision litho-printed scale is accurate and easy to read.

Red tipped pointer of heat treated aluminum tubing is easy to see. It is rigidly mounted on helix shaft.

Pointer stops of molded rubber prevent pointer over-travel without damage.

"Wishbone" assembly provides mounting for helix, helix bearings and pointer shaft.

Jeweled bearings are shock-resistant mounted; provide virtually friction-free motion for helix. Motion damped with high viscosity silicone fluid.

Zero adjustment screw is conveniently located in plastic cover, accessible without removing cover. O-ring seal provides pressure tightness.

O-ring seal for cover assures pressure integrity of case.

Blowout plug of silicone rubber protects against overpressure on 15 PSIG rated models. Opens at approximately 25 PSIG.

Die cast aluminum case is precision made. Iridite-dipped to withstand 168 hour salt spray test. Exterior finished in baked dark gray hammerloid. One case size used for all standard pressure ranges, and for both surface and flush mounting.

Silicone rubber diaphragm with integrally molded O-ring is supported by front and rear plates. It is locked and sealed in position with a sealing plate and retaining ring. Diaphragm motion is restricted to prevent damage due to overpressures.

Calibrated range spring is flat spring steel. Small amplitude of motion assures consistency and long life. It reacts to pressure on diaphragm. Live length adjustable for calibration.

Samarium Cobalt magnet mounted at one end of range spring rotates helix without mechanical linkages.

Helix is precision milled from an alloy of high magnetic permeability. Mounted in jeweled bearings, it turns freely to align with magnetic field of magnet to transmit pressure indication to pointer.

Dual Scale English/Metric Models		
Model Number	**Range, In. W.C.**	**Range, Pa or kPa**
2000-0D	0-0.5	0-125 Pa
2001D	0-1.0	0-250 Pa
2002D	0-2.0	0-500 Pa
2003D	0-3.0	0-700 Pa
2004D	0-4.0	0-1.0 kPa
2006D	0-6.0	0-1.5 kPa
2008D	0-8.0	0-2.0 kPa
2010D	0-10	0-2.5 kPa

SERIES 2000 MAGNEHELIC® — MODELS AND RANGES
STOCKED MODELS in bold

The models below will fulfill most requirements. Page 4 also shows examples of special models built for OEM customers. For special scales furnished in ounces per square inch, inches of mercury, metric units, etc., contact the factory.

Model Number	Range Inches of Water
2000-00†	0-.25
2000-0†	0-.50
2001	0-1.0
2002	0-2.0
2003	0-3.0
2004	0-4.0
2005	0-5.0
2006	0-6.0
2008	0-8.0
2010	0-10
2015	0-15
2020	0-20
2025	0-25
2030	0-30
2040	0-40
2050	0-50
2060	0-60
2080	0-80
2100	0-100
2150	0-150

Model Number	Range Zero Center Inches of Water
2300-0†	.25-0-.25
2301	.5-0-.5
2302	1-0-1
2304	2-0-2
2310	5-0-5
2320	10-0-10
2330	15-0-15

Model Number	Range PSI
2201	0-1
2202	0-2
2203	0-3
2204	0-4
2205	0-5
2210*	0-10
2215*	0-15
2220*	0-20
2230**	0-30

*MP option standard
**HP option standard

Dual Scale Air Velocity Units

Model Number	Range in W.C.I Velocity, F.P.M.
2000-00AV	0-.25/300-2000
2000-0AV	0-.50/500-2800
2001AV	0-1.0/500-4000
2002AV	0-2.0/1000-5600
2010AV	0-10/2000-12500

For use with pitot tube.

Model Number	Range MM of Water
2000-6MM†	0-6
2000-10MM	0-10
2000-25MM	0-25
2000-50MM	0-50
2000-80MM	0-80
2000-100MM	0-100

Zero Center Ranges

2300-20MM†	10-0-10

Model Number	Range, CM of Water
2000-15CM	0-15
2000-20CM	0-20
2000-25CM	0-25
2000-50CM	0-50
2000-80CM	0-80
2000-100CM	0-100
2000-150CM	0-150
2000-200CM	0-200
2000-250CM	0-250
2000-300CM	0-300

Zero Center Ranges

2300-4CM	2-0-2
2300-10CM	5-0-5
2300-30CM	15-0-15

†These ranges calibrated for vertical scale position.

Model Number	Range, Pascals
2000-60 Pa†	0-60
2000-125 Pa†	0-125
2000-250 Pa	0-250
2000-500 Pa	0-500
2000-750 Pa	0-700

Zero Center Ranges

2300-250 Pa	125-0-125
2300-500 Pa	250-0-250

Model Number	Range, Kilopascals
2000-1 kPa	0-1
2000-1.5 kPa	0-1.5
2000-2 kPa	0-2
2000-3 kPa	0-3
2000-4 kPa	0-4
2000-5 kPa	0-5
2000-8 kPa	0-8
2000-10 kPa	0-10
2000-15 kPa	0-15
2000-20 kPa	0-20
2000-25 kPa	0-25
2000-30 kPa	0-30

Zero Center Ranges

2300-1 kPa	.5-0-.5
2300-3 kPa	1.5-0-1.5

Accessories
A-310A, 3-Way Vent Valve
A-321, Safety Relief Valve
A-432, Portable Kit
A-605, Air Filter Kit
A-610, Pipe Mount Kit
Scale Overlays — Red, Green, Mirrored or Combination, Specify Locations

Options — To order, add suffix: I.E. 2001-ASF
ASF (Adjustable Signal Flag)
HP (High Pressure Option)
LT (Low Temperatures to -20°F)
MP (Med. Pressure Option)
SP (Setpoint Indicator

Special Purpose Ranges
Scale No. 2401 Square Root Specify Range
Scale No. 2402 Blank Scale Specify Range
Model 2000-00N. range -.05 to +.20" W.C. For room pressure monitoring

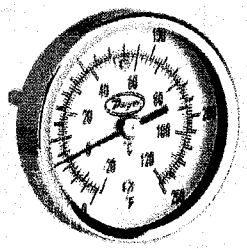
1011R01-0298P

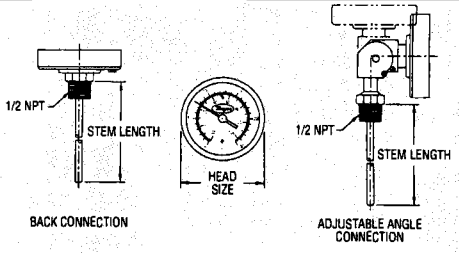
Series BT

Bimetal Thermometers

2", 3" or 5" Dial, Dual Scale, ±1% FS Accuracy, External Reset

NEW MODELS!





Series BT Bimetal Thermometers offer accurate, reliable service even in the toughest environments. These corrosion resistant units are constructed from stainless steel and are hermetically sealed to prevent crystal fogging. The bimetal element directly drives pointer, eliminating gears and linkage. An external reset screw allows field calibration and easy-to-read aluminum dial minimizes parallax error. Choose back connection, lower connection or adjustable angle for easy viewing and installation. Adjustable models can be rotated a full 360° and tilted over a 180° arc. NOTE: When using in pressurized applications, use a suitable thermowell.

SPECIFICATIONS

Accuracy: ±1% full scale.
Response Time: ≤ 40 seconds.
Temperature Limits: Head 200°F (93°C); **Stem** Not to exceed 50% over-range or 1000°F (538°C) or 800°F (427°C) continuously.
Immersion Depth: Minimum 2" in liquids, 4" in gas.
Stem Diameter: ¼" O.D.
Materials of Construction: 304 stainless steel stem, glass crystal, anodized aluminum dial, Series 300 stainless steel head, bezel, and mounting bushing.
Process Connection: ¼" NPT on 2" dial size; ½" NPT on 3" or 5" dial size.

STOCKED MODELS

	Dial Size, Stem Length	Temperature Range, °F(°C)	Degree Div., °F(°C)
Back Connection			
BTB22551*	2", 2-½"	0/250	2
BTB2405D	2", 4"	0/250(-20/120)	2(2)
BTB2409D	2", 4"	200/1000(100/550)	10(5)
BTB32510D	3", 2½"	0/200 (-20/100)	2(2)
BTB3255D	3", 2½"	0/250(20/120)	2(2)
BTB3257D	3", 2½"	50/550 (10/290)	5(5)
BTB34010D	3", 4"	0/200 (-20/100)	2(2)
BTB3405D	3", 4"	0/250(-20/120)	2(2)
BTB3407D	3", 4"	50/550(10/290)	5(5)
BTB3605D	3", 6"	0/250(-20/120)	2(2)

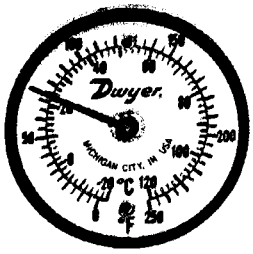
Model Number	Dial Size, Stem Length	Temperature Range, °F(°C)	Degree Div., °F(°C)
Adjustable Angle Connection			
BTA54010D	5", 4"	0/200(-20/100)	2(2)
BTA5405D	5", 4"	0/250(-20/120)	2(2)
BTA5407D	5", 4"	50/550(10/290)	5(5)
BTA56010D	5", 6"	0/200(-20/100)	2(2)
BTA5605D	5", 6"	0/250(-20/120)	2(2)
BTA5607D	5", 6"	50/550(10/290)	5(5)
Lower Connection			
BTC3255D	3", 2.5"	0/250(-20/120)	2(2)

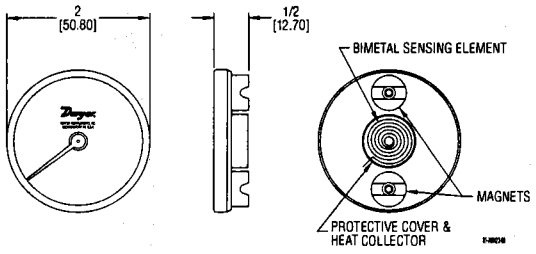
Temperature

Series ST

Surface Mount Thermometer

2" Dual Scale Dial, ±2% Full Scale Accuracy





Measure the temperature of boilers, air ducts, motors, bearings, furnaces or other surfaces with Series ST Surface Mount Thermometers. Dual magnet design allows easy mounting on any ferrous surface. Bi-metallic thermal sensing coil provides quick temperature measurement with ±2% full scale accuracy.

SPECIFICATIONS

Accuracy: ±2% full scale.
Sensing Element: Bimetal coil.
Response Time: Approximately one minute.
Head Size: 2" (5.08 cm).
Mounting: Two Alnico® magnets on back.
Height: 2" (1.27 cm).
Case: Aluminum with optically clear crystal.
Weight: 2 oz (56.7 g).

STOCKED MODELS

Model Number	Range
ST250	0 to 250°F (-20 to 120°C)
ST500	0 to 500°F (-20 to 260°C)
ST750	0 to 750 °F (-20 to 399°C)

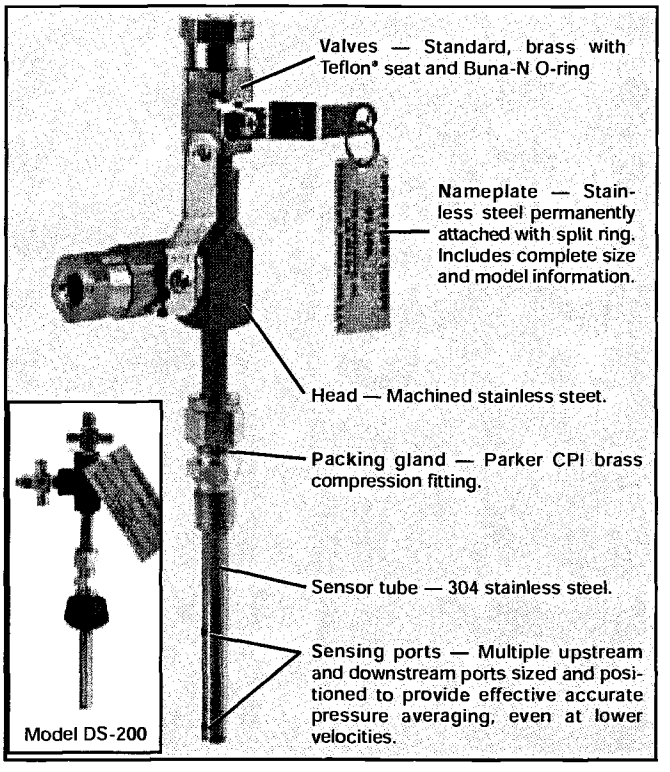
APPLICATIONS

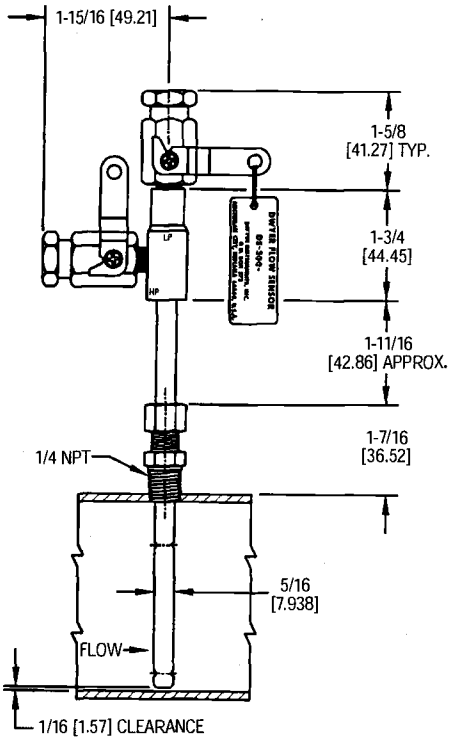
Manifolds, platens, boilers, air ducts, furnaces, engines, motors, bearings, enclosures, cabinets, drums, plumbing, piping, refrigerators, and other ferrous surfaces.

Air Velocity

Series DS Flow Sensors

For use with the Dwyer Capsuhelic® differential pressure gage.





Dwyer Flow Sensors are averaging pitot tubes that provide accurate and convenient flow rate sensing. When purchased with a Dwyer Capsuhelic® differential pressure gage of appropriate range, the result is a flow indicating system delivered off the shelf at an economical price.

Pitot tubes have been used in flow measurement for years. Conventional pitot tubes sense velocity pressure at only one point in the flowing stream. Therefore, a series of measurements must be taken across the stream to obtain a meaningful average flow rate. The Dwyer flow sensor eliminates the need for "traversing" the flowing stream because of its multiple sensing points and built-in averaging capability.

Series DS-200 models are available in ten insertion lengths from 1" - 10". Operation is similar to DS-300 units. Basic differences are the multi-turn shut-off valves, 3/8" NPT mounting and installed 1/4" SAE 45° flared pressure connections.

Dwyer Series DS-300 flow sensors are designed to be inserted in the pipeline through a compression fitting. They are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with 1/8" NPT(F) connections. Accessories include adapters with 1/4" SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic kit. Standard valves are rated at 200 psig (13.7 bar) and 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 flow sensors are available for pipe sizes from 1" to 10". If replacing a DS-200 flow sensor or using an A-160 thredolet with a DS-300, an optional 1/4" x 3/8" bushing, P/N A-161 is required.

DS-400 Averaging Flow Sensors are quality constructed from extra strong 3/4" dia. stainless steel to resist increased forces encountered at higher flow rates with both air and water. This extra strength also allows them to be made in longer insertion lengths up to 24 inches (61 cm). All models include convenient and quick-acting quarter-turn ball valves to isolate the sensor for zeroing. Process connections to the valve assembly are 1/8" NPT(F). A pair of 1/8" NPT × 1/4" SAE 45° flared adapters are included, compatible with hoses used in the Model A-471 Portable Capsuhelic® Gage Kit. Supplied solid brass mounting adapter has a 3/4" dia. compression fitting to lock in required insertion length and a 3/4" NPT(M) thread for mounting in a thred-o-let (not included).

STOCKED MODELS

Select model with suffix which matches pipe size

DS-200-1"	**DS-300-1"**
DS-200-1¼"	**DS-300-1¼"**
DS-200-1½"	**DS-300-1½"**
DS-200-2"	**DS-300-2"**
DS-200-2½"	**DS-300-2½"**
DS-200-3"	**DS-300-3"**
DS-200-4"	**DS-300-4"**
DS-200-6"	**DS-300-6"**
DS-200-8"	**DS-300-8"**
DS-200-10"	**DS-300-10"**

DS-400-6"
DS-400-8"
DS-400-10"
DS-400-12"
DS-400-14"
DS-400-16"
DS-400-18"
DS-400-20"
DS-400-24"

Options and Accessories

A-160 Thredolet, 3/8" NPT, forged steel, 3000 psi
A-161 Brass Bushing, 1/4" x 3/8"
DS-200-VK Series DS Flow Sensors Valve Kit
Less Valves (DS-300) To order, add suffix -LV

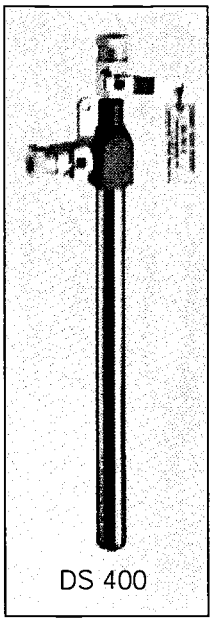
How To Order

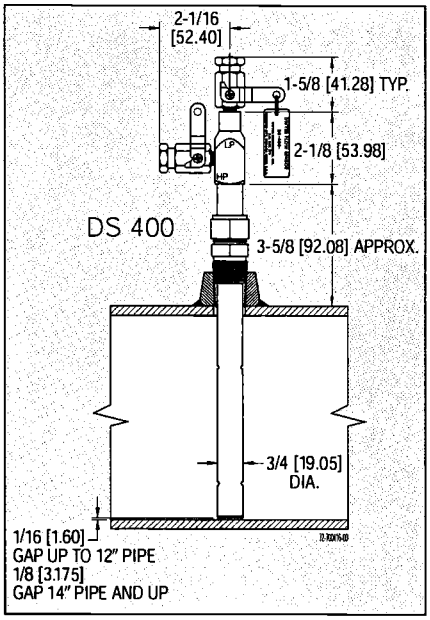
Merely determine the pipe size into which the flow sensor will be mounted and designate the size as a suffix to Model DS-300. For example, a flow sensor to be mounted in a 2" pipe would be a Model No. DS-300-2".

For non-critical water and air flow monitoring applications, the chart below can be utilized for ordering a stock Capsuhelic® differential pressure gage for use with the DS-300 flow sensor. Simply locate the maximum flow rate for the media being measured under the appropriate pipe size and read the Capsuhelic® gage range in inches of water column to the left. The DS-300 sensor is supplied with installation and operating instructions, Bulletin F-50. It also includes complete flow conversion information for the three media conditions shown in the chart below. This information enables the user to create a complete differential pressure to flow rate conversion table for the sensor and differential pressure gage employed. Both the Dwyer Capsuhelic® gage and flow sensor feature excellent repeatability so, once the desired flow rate is determined, deviation from that flow in quantitative measure can be easily determined. You may wish to order the adjustable signal flag option for the Capsuhelic® gage to provide an easily identified reference point for the proper flow.

Capsuhelic® gages with special ranges and/or direct reading scales in appropriate flow units are available on special order for more critical applications. Customer supplied data for the full scale flow (quantity and units) is required along with the differential pressure reading at that full flow figure. Prior to ordering a special Capsuhelic® differential pressure gage for flow read-out, we recommend you request Bulletin F-50 to obtain complete data on converting flow rates of various media to the sensor differential pressure output. With this bulletin and after making a few simple calculations, the exact range gage required can easily be determined.

Large 3/4 Inch Diameter for Extra Strength in Lengths to 24 Inches





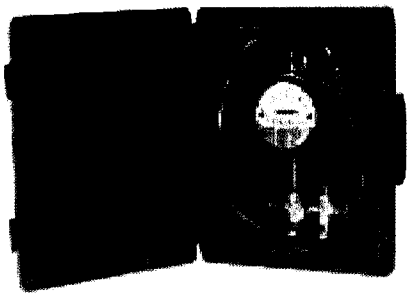
Air Velocity

GAGE RANGE (IN. W.C.)	MEDIA @ 70°F	FULL RANGE FLOWS BY PIPE SIZE (APPROXIMATE)									
		1"	1¼"	1½"	2"	2½"	3"	4"	6"	8"	10"
2	Water (GPM)	4.8	8.3	11.5	20.5	30	49	86	205	350	560
	Air @ 14.7 PSIA (SCFM)	19.0	33.0	42.0	65.0	113	183	330	760	1340	2130
	Air @ 100 PSIG (SCFM)	50.0	90.5	120.0	210.0	325	510	920	2050	3600	6000
5	Water (GPM)	7.7	14.0	18.0	34.0	47	78	138	320	560	890
	Air @ 14.7 PSIA (SCFM)	30.0	51.0	66.0	118.0	178	289	510	1200	2150	3400
	Air @ 100 PSIG (SCFM)	83.0	142.0	190.0	340.0	610	820	1600	3300	5700	10000
10	Water (GPM)	11.0	19.0	25.5	45.5	67	110	195	450	800	1260
	Air @ 14.7 PSIA (SCFM)	41.0	72.0	93.0	163.0	250	410	725	1690	3040	4860
	Air @ 100 PSIG (SCFM)	120.0	205.0	275.0	470.0	740	1100	2000	4600	8100	15000
25	Water (GPM)	18.0	32.0	40.5	72.0	108	173	310	720	1250	2000
	Air @ 14.7 PSIA (SCFM)	63.0	112.0	155.0	255.0	390	640	1130	2630	4860	7700
	Air @ 100 PSIG (SCFM)	185.0	325.0	430.0	760.0	1200	1800	3300	7200	13000	22000
50	Water (GPM)	25.0	44.0	57.5	100.0	152	247	435	1000	1800	
	Air @ 14.7 PSIA (SCFM)	90.0	161.0	205.0	360.0	560	900	1600	3700	6400	
	Air @ 100 PSIG (SCFM)	260.0	460.0	620.0	1050.0	1700	2600	4600	10000	18500	
100	Water (GPM)	36.5	62.0	82.0	142.0	220	350	620	1500		
	Air @ 14.7 PSIA (SCFM)	135.0	230.0	300.0	505.0	800	1290	2290	5000		
	Air @ 100 PSIG (SCFM)	370.0	660.0	870.0	1500.0	2300	3600	6500	15000		

Model A-471 Portable Kit

The Dwyer Series 4000 Capsuhelic® differential pressure gage is ideally suited for use as a read-out device with the DS-300 Flow Sensors. The gage may be used on system pressures of up to 500 PSIG even when the flow sensor differential pressure to be read is less than 0.5" w.c. With accuracy of ±3% of full scale, the Capsuhelic® gage can be used in ambient temperatures from 32°F to 200°F. Zero and range adjustments are made from outside the gage. The standard gage with a die cast aluminum housing can be used with the flow sensor for air or oil applications. For water flow measurements, the optional forged brass housing should be specified. The Capsuhelic gage may be panel or surface mounted and permanently plumbed to the flow sensor if desired. The optional A-610 pipe mounting bracket allows the gage to be easily attached to any 1¼" - 2" horizontal or vertical pipe.

For portable operation, the A-471 Capsuhelic Portable Gage Kit is available complete with tough polypropylene carrying case, mounting bracket, 3-way manifold valve, two 10' high pressure hoses, and all necessary fittings. See pages 7 and 8 for complete information on the Capsuhelic gage.

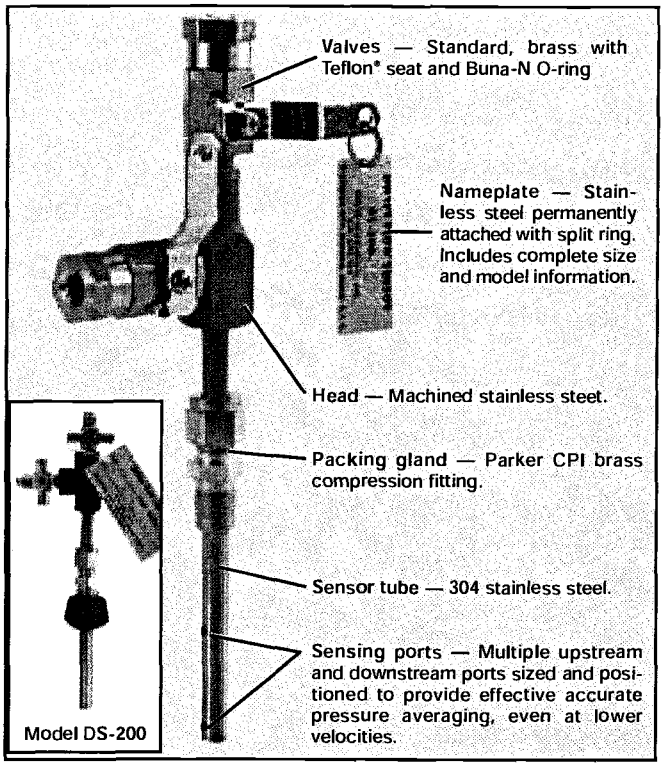


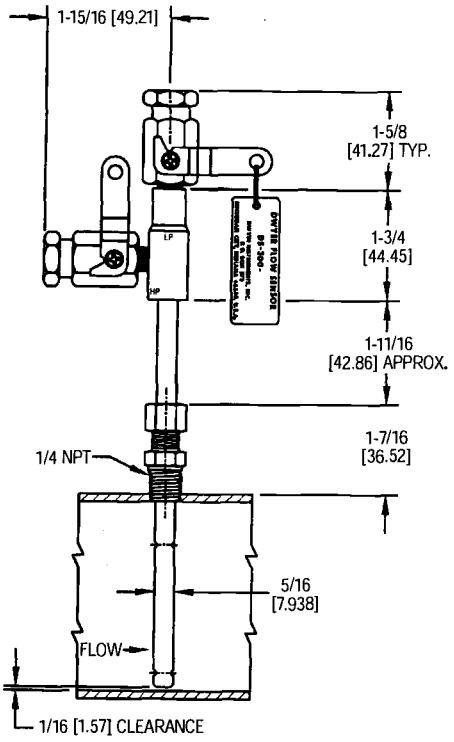
CAPSUHELIC GAGE SHOWN INSTALLED IN A-471 PORTABLE KIT

Air Velocity

Series DS Flow Sensors

For use with the Dwyer Capsuhelic® differential pressure gage.





Dwyer Flow Sensors are averaging pitot tubes that provide accurate and convenient flow rate sensing. When purchased with a Dwyer Capsuhelic® differential pressure gage of appropriate range, the result is a flow indicating system delivered off the shelf at an economical price.

Pitot tubes have been used in flow measurement for years. Conventional pitot tubes sense velocity pressure at only one point in the flowing stream. Therefore, a series of measurements must be taken across the stream to obtain a meaningful average flow rate. The Dwyer flow sensor eliminates the need for "traversing" the flowing stream because of its multiple sensing points and built-in averaging capability.

Series DS-200 models are available in ten insertion lengths from 1" - 10". Operation is similar to DS-300 units. Basic differences are the multi-turn shut-off valves, 3/8" NPT mounting and installed 1/4" SAE 45° flared pressure connections.

Dwyer Series DS-300 flow sensors are designed to be inserted in the pipeline through a compression fitting. They are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with 1/8" NPT(F) connections. Accessories include adapters with 1/4" SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic kit. Standard valves are rated at 200 psig (13.7 bar) and 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 flow sensors are available for pipe sizes from 1" to 10". If replacing a DS-200 flow sensor or using an A-160 thredolet with a DS-300, an optional 1/4" x 3/8" bushing, P/N A-161 is required.

DS-400 Averaging Flow Sensors are quality constructed from extra strong 3/4" dia. stainless steel to resist increased forces encountered at higher flow rates with both air and water. This extra strength also allows them to be made in longer insertion lengths up to 24 inches (61 cm). All models include convenient and quick-acting quarter-turn ball valves to isolate the sensor for zeroing. Process connections to the valve assembly are 1/8" NPT(F). A pair of 1/8" NPT × 1/4" SAE 45° flared adapters are included, compatible with hoses used in the Model A-471 Portable Capsuhelic® Gage Kit. Supplied solid brass mounting adapter has a 3/4" dia. compression fitting to lock in required insertion length and a 3/4" NPT(M) thread for mounting in a thred-o-let (not included).

STOCKED MODELS

Select model with suffix which matches pipe size

DS-200-1"	**DS-300-1"**
DS-200-1¼"	**DS-300-1¼"**
DS-200-1½"	**DS-300-1½"**
DS-200-2"	**DS-300-2"**
DS-200-2½"	**DS-300-2½"**
DS-200-3"	**DS-300-3"**
DS-200-4"	**DS-300-4"**
DS-200-6"	**DS-300-6"**
DS-200-8"	**DS-300-8"**
DS-200-10"	**DS-300-10"**

DS-400-6"
DS-400-8"
DS-400-10"
DS-400-12"
DS-400-14"
DS-400-16"
DS-400-18"
DS-400-20"
DS-400-24"

Options and Accessories

A-160 Thredolet, 3/8" NPT, forged steel, 3000 psi
A-161 Brass Bushing, 1/4" x 3/8"
DS-200-VK Series DS Flow Sensors Valve Kit
Less Valves (DS-300) To order, add suffix -LV

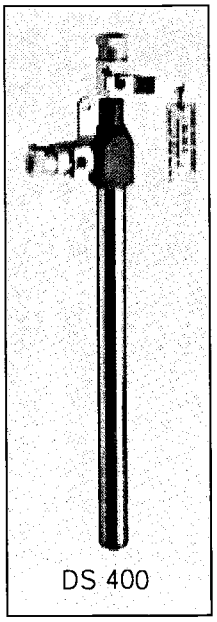
How To Order

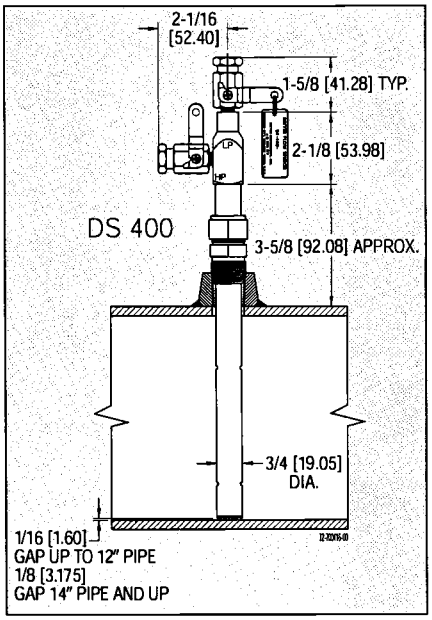
Merely determine the pipe size into which the flow sensor will be mounted and designate the size as a suffix to Model DS-300. For example, a flow sensor to be mounted in a 2" pipe would be a Model No. DS-300-2".

For non-critical water and air flow monitoring applications, the chart below can be utilized for ordering a stock Capsuhelic® differential pressure gage for use with the DS-300 flow sensor. Simply locate the maximum flow rate for the media being measured under the appropriate pipe size and read the Capsuhelic® gage range in inches of water column to the left. The DS-300 sensor is supplied with installation and operating instructions, Bulletin F-50. It also includes complete flow conversion information for the three media conditions shown in the chart below. This information enables the user to create a complete differential pressure to flow rate conversion table for the sensor and differential pressure gage employed. Both the Dwyer Capsuhelic® gage and flow sensor feature excellent repeatability so, once the desired flow rate is determined, deviation from that flow in quantitative measure can be easily determined. You may wish to order the adjustable signal flag option for the Capsuhelic® gage to provide an easily identified reference point for the proper flow.

Capsuhelic® gages with special ranges and/or direct reading scales in appropriate flow units are available on special order for more critical applications. Customer supplied data for the full scale flow (quantity and units) is required along with the differential pressure reading at that full flow figure. Prior to ordering a special Capsuhelic® differential pressure gage for flow read-out, we recommend you request Bulletin F-50 to obtain complete data on converting flow rates of various media to the sensor differential pressure output. With this bulletin and after making a few simple calculations, the exact range gage required can easily be determined.

Large 3/4 Inch Diameter for Extra Strength in Lengths to 24 Inches



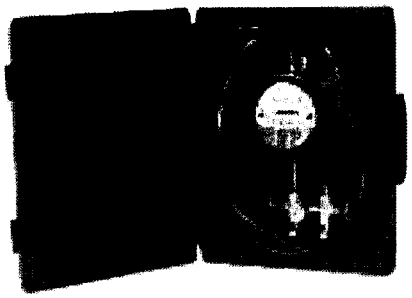


GAGE RANGE (IN. W.C.)	MEDIA @ 70°F	FULL RANGE FLOWS BY PIPE SIZE (APPROXIMATE)									
		1"	1¼"	1½"	2"	2½"	3"	4"	6"	8"	10"
2	Water (GPM)	4.8	8.3	11.5	20.5	30	49	86	205	350	560
	Air @ 14.7 PSIA (SCFM)	19.0	33.0	42.0	65.0	113	183	330	760	1340	2130
	Air @ 100 PSIG (SCFM)	50.0	90.5	120.0	210.0	325	510	920	2050	3600	6000
5	Water (GPM)	7.7	14.0	18.0	34.0	47	78	138	320	560	890
	Air @ 14.7 PSIA (SCFM)	30.0	51.0	66.0	118.0	178	289	510	1200	2150	3400
	Air @ 100 PSIG (SCFM)	83.0	142.0	190.0	340.0	610	820	1600	3300	5700	10000
10	Water (GPM)	11.0	19.0	25.5	45.5	67	110	195	450	800	1260
	Air @ 14.7 PSIA (SCFM)	41.0	72.0	93.0	163.0	250	410	725	1690	3040	4860
	Air @ 100 PSIG (SCFM)	120.0	205.0	275.0	470.0	740	1100	2000	4600	8100	15000
25	Water (GPM)	18.0	32.0	40.5	72.0	108	173	310	720	1250	2000
	Air @ 14.7 PSIA (SCFM)	63.0	112.0	155.0	255.0	390	640	1130	2630	4860	7700
	Air @ 100 PSIG (SCFM)	185.0	325.0	430.0	760.0	1200	1800	3300	7200	13000	22000
50	Water (GPM)	25.0	44.0	57.5	100.0	152	247	435	1000	1800	
	Air @ 14.7 PSIA (SCFM)	90.0	161.0	205.0	360.0	560	900	1600	3700	6400	
	Air @ 100 PSIG (SCFM)	260.0	460.0	620.0	1050.0	1700	2600	4600	10000	18500	
100	Water (GPM)	36.5	62.0	82.0	142.0	220	350	620	1500		
	Air @ 14.7 PSIA (SCFM)	135.0	230.0	300.0	505.0	800	1290	2290	5000		
	Air @ 100 PSIG (SCFM)	370.0	660.0	870.0	1500.0	2300	3600	6500	15000		

Model A-471 Portable Kit

The Dwyer Series 4000 Capsuhelic® differential pressure gage is ideally suited for use as a read-out device with the DS-300 Flow Sensors. The gage may be used on system pressures of up to 500 PSIG even when the flow sensor differential pressure to be read is less than 0.5" w.c. With accuracy of ±3% of full scale, the Capsuhelic® gage can be used in ambient temperatures from 32°F to 200°F. Zero and range adjustments are made from outside the gage. The standard gage with a die cast aluminum housing can be used with the flow sensor for air or oil applications. For water flow measurements, the optional forged brass housing should be specified. The Capsuhelic gage may be panel or surface mounted and permanently plumbed to the flow sensor if desired. The optional A-610 pipe mounting bracket allows the gage to be easily attached to any 1¼" - 2" horizontal or vertical pipe.

For portable operation, the A-471 Capsuhelic Portable Gage Kit is available complete with tough polypropylene carrying case, mounting bracket, 3-way manifold valve, two 10' high pressure hoses, and all necessary fittings. See pages 7 and 8 for complete information on the Capsuhelic gage.

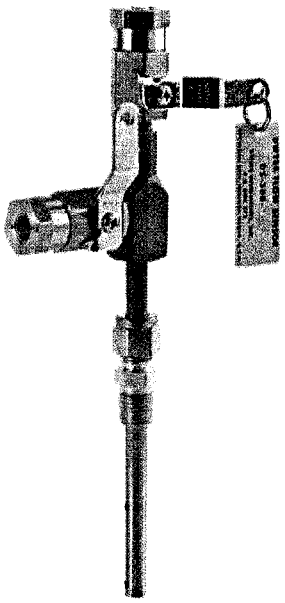


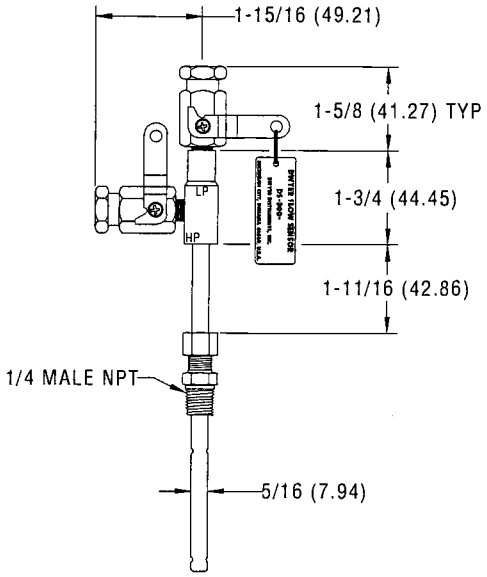
CAPSUHELIC GAGE SHOWN INSTALLED IN A-471 PORTABLE KIT

Series DS-300 Flow Sensors

Bulletin F-50

Installation and Operating Instructions Flow Calculations





Series DS-300 Flow Sensors are averaging pitot tubes that provide accurate, convenient flow rate sensing. When purchased with a Dwyer Capsuhelic® for liquid flow or Magnehelic® for air flow, differential pressure gage of appropriate range, the result is a flow-indicating system delivered off the shelf at an economical price. Series DS-300 Flow Sensors are designed to be inserted in the pipeline through a compression fitting and are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with 1/8" female NPT connections. Accessories include adapters with 1/4" SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic® kit. Standard valves are rated at 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 Flow Sensors are available for pipe sizes from 1" to 10".

INSPECTION

Inspect sensor upon receipt of shipment to be certain it is as ordered and not damaged. If damaged, contact carrier.

INSTALLATION

General - The sensing ports of the flow sensor must be correctly positioned for measurement accuracy. The instrument connections on the sensor indicate correct positioning. The side connection is for total or high pressure and should be pointed upstream. The top connection is for static or low pressure.

Location - The sensor should be installed in the flowing line with as much straight run of pipe upstream as possible. A rule of thumb is to allow 10 - 15 pipe diameters upstream and 5 downstream. The table below lists recommended up and down piping.

PRESSURE AND TEMPERATURE

Maximum: 200 psig (13.78 bar) at 200°F (93.3°C).

Upstream and Downstream Dimensions in Terms of Internal Diameter of Pipe*

Upstream Condition	Minimum Diameter of Straight Pipe		
	Upstream		Downstream
	In-Plane	Out of Plane	
One Elbow or Tee	7	9	5
Two 90° Bends in Same Plane	8	12	5
Two 90° Bends in Different Plane	18	24	5
Reducers or Expanders	8	8	5
All Valves**	24	24	5

* Values shown are recommended spacing, in terms of internal diameter for normal industrial metering requirements. For laboratory or high accuracy work, add 25% to values.

** Includes gate, globe, plug and other throttling valves that are only partially opened. If valve is to be fully open, use values for pipe size change. **CONTROL VALVES SHOULD BE LOCATED AFTER THE FLOW SENSOR.**

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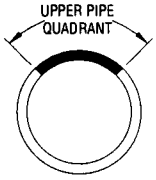
POSITION

Be certain there is sufficient clearance between the mounting position and other pipes, walls, structures, etc, so that the sensor can be inserted through the mounting unit once the mounting unit has been installed onto the pipe.

Flow sensors should be positioned to keep air out of the instrument connecting lines on liquid flows and condensate out of the lines on gas flows. The easiest way to assure this is to install the sensor into the pipe so that air will bleed into, or condensate will drain back to, the pipe.

For Air or Gas Flow

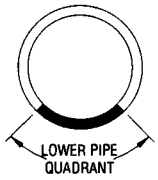
Install in upper quadrant of pipe



Condensate drains back to pipe

For Liquid or Steam Flow

Install in lower quadrant of pipe



Air bleeds back to pipe

INSTALLATION

1. When using an A-160 thred-o-let, weld it to the pipe wall. If replacing a DS-200 unit, an A-161 bushing (1/4˝ x 3/8˝) will be needed.

2. Drill through center of the thred-o-let into the pipe with a drill that is slightly larger than the flow sensor diameter.

3. Install the packing gland using proper pipe sealant. If the packing gland is disassembled, note that the tapered end of the ferrule goes into the fitting body.

4. Insert sensor until it bottoms against opposite wall of the pipe, then withdraw 1/16˝ to allow for thermal expansion.

5. Tighten packing gland nut finger tight. Then tighten nut with a wrench an additional 1-1/4 turns. Be sure to hold the sensor body with a second wrench to prevent the sensor from turning.

INSTRUMENT CONNECTION

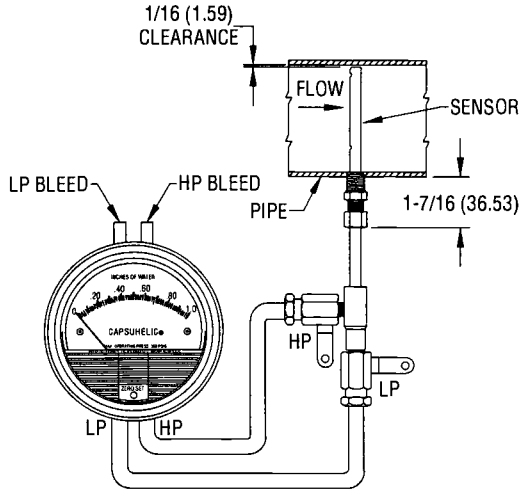
Connect the slide pressure tap to the high pressure port of the Magnehelic® (air only) or Capsuhelic® gage or transmitting instrument and the top connection to the low pressure port.

See the connection schematics below.

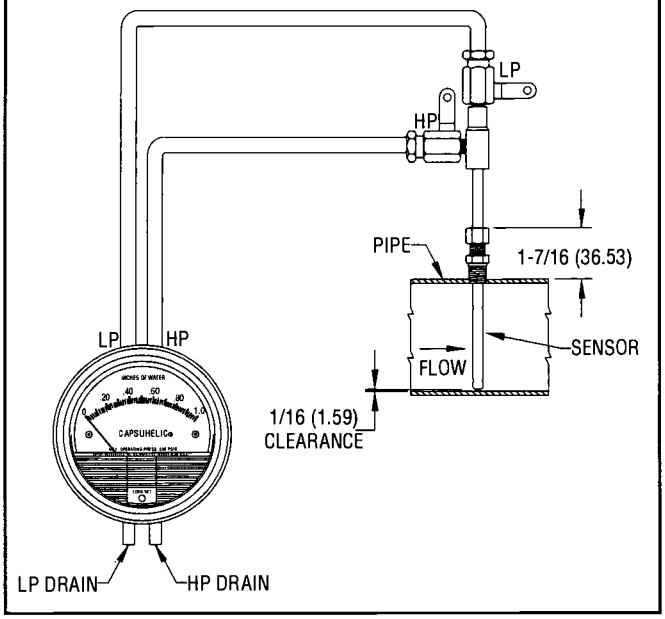
Bleed air from instrument piping on liquid flows. Drain any condensate from the instrument piping on air and gas flows.

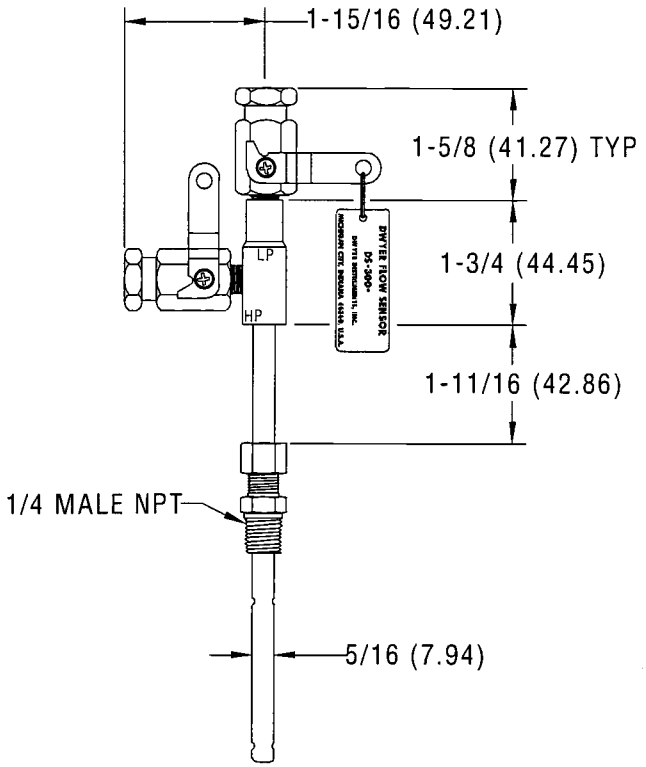
Open valves to instrument to place flow meter into service. For permanent installations, a 3-valve manifold is recommended to allow the gage to be zero checked without interrupting the flow. The Dwyer A-471 Portable Test Kit includes such a device.

Water Flow



Air or Gas Flow





Flow Calculations and Charts

The following information contains tables and equations for determining the differential pressure developed by the DS-300 Flow Sensor for various flow rates of water, steam, air or other gases in different pipe sizes.

This information can be used to prepare conversion charts to translate the differential pressure readings being sensed into the equivalent flow rate. When direct readout of flow is required, use this information to calculate the full flow differential pressure in order to specify the exact range of Dwyer Magnehelic® or Capsuhelic® gage required. Special ranges and calculations are available for these gages at minimal extra cost. See bulletins A-30 and F-41 for additional information on Magnehelic® and Capsuhelic® gages and DS-300 flow sensors.

For additional useful information on making flow calculations, the following service is recommended: Crane Valve Co. Technical Paper No. 410 "Flow of Fluids Through Valves, Fittings and Pipe." It is available from Crane Valve Company, www.cranevalve.com.

Using the appropriate differential pressure equation from Page 4 of this bulletin,calculate the differential pressure generated by the sensor under normal operating conditions of the system. Check the chart below to determine if this value is within the recommended operating range for the sensor. Note that the data in this chart is limited to standard conditions of air at 60°F (15.6°C) and 14.7 psia static line pressure or water at 70°F (21.1°C). To determine recommended operating ranges of other gases, liquids an/or operating conditions, consult factory.

Note: the column on the right side of the chart which defines velocity ranges to avoid. Continuous operation within these ranges can result in damage to the flow sensor caused by excess vibration.

Pipe Size (Schedule 40)	Flow Coefficient "K"	Operating Ranges Air @ 60°F & 14.7 psia (D/P in. W.C.)	Operating Ranges Air @ 60°F & 14.7 psia (D/P in. W.C.)	Velocity Ranges Not Recommended (Feet per Second)
1	0.52	1.10 to 186	4.00 to 675	146 to 220
1-1/4	0.58	1.15 to 157	4.18 to 568	113 to 170
1-1/2	0.58	0.38 to 115	1.36 to 417	96 to 144
2	0.64	0.75 to 75	2.72 to 271	71 to 108
2-1/2	0.62	1.72 to 53	6.22 to 193	56 to 85
3	0.67	0.39 to 35	1.43 to 127	42 to 64
4	0.67	0.28 to 34	1.02 to 123	28 to 43
6	0.71	0.64 to 11	2.31 to 40	15 to 23
8	0.67	0.10 to 10	0.37 to 37	9.5 to 15
10	0.70	0.17 to 22	0.60 to 79	6.4 to 10

FLOW EQUATIONS

1. Any Liquid

$$Q\ (GPM) = 5.668 \times K \times D^2 \times \sqrt{\Delta P / S_f}$$

2. Steam or Any Gas

$$Q\ (lb/Hr) = 359.1 \times K \times D^2 \times \sqrt{p \times \Delta P}$$

3. Any Gas

$$Q\ (SCFM) = 128.8 \times K \times D^2 \times \sqrt{\frac{P \times \Delta P}{(T + 460) \times S_s}}$$

DIFFERENTIAL PRESSURE EQUATIONS

1. Any Liquid

$$\Delta P\ (in.\ WC) = \frac{Q^2 \times S_f}{K^2 \times D^4 \times 32.14}$$

2. Steam or Any Gas

$$\Delta P\ (in.\ WC) = \frac{Q^2}{K^2 \times D^4 \times p \times 128{,}900}$$

3. Any Gas

$$\Delta P\ (in.\ WC) = \frac{Q^2 \times S_s \times (T + 460)}{K^2 \times D^4 \times P \times 16{,}590}$$

Technical Notations

The following notations apply:

ΔP = Differential pressure expressed in inches of water column
Q = Flow expressed in GPM, SCFM, or PPH as shown in equation
K = Flow coefficient— See values tabulated on Pg. 3.
D = Inside diameter of line size expressed in inches.

For square or rectangular ducts, use: $D = \sqrt{\frac{4 \times \text{Height} \times \text{Width}}{\pi}}$

P = Static Line pressure (psia)
T = Temperature in degrees Fahrenheit (plus 460 = °Rankine)
p = Density of medium in pounds per square foot
S_f = Sp Gr at flowing conditions
S_s = Sp Gr at 60°F (15.6°C)

SCFM TO ACFM EQUATION

$$SCFM = ACFM \times \left(\frac{14.7 + PSIG}{14.7}\right) \left(\frac{520^*}{460 + °F}\right)$$

$$ACFM = SCFM \times \left(\frac{14.7}{14.7 + PSIG}\right) \left(\frac{460 + °F}{520}\right)$$

$$\text{POUNDS PER CUBIC FOOT STD.} = \text{POUNDS PER CUBIC FOOT ACT.} \times \left(\frac{14.7}{14.7 + PSIG}\right) \left(\frac{460 + °F}{520^*}\right)$$

$$\text{POUNDS PER CUBIC FOOT ACT.} = \text{POUNDS PER CUBIC FOOT STD.} \times \left(\frac{14.7 + PSIG}{14.7}\right) \left(\frac{520^*}{460 + °F}\right)$$

1 Cubic foot of air = 0.076 pounds per cubic foot at 60° F (15.6°C) and 14.7 psia.
* (520°= 460 + 60°) Std. Temp. Rankine

 Printed in U.S.A. 9/03 FR 72-440451-01 Rev. 1

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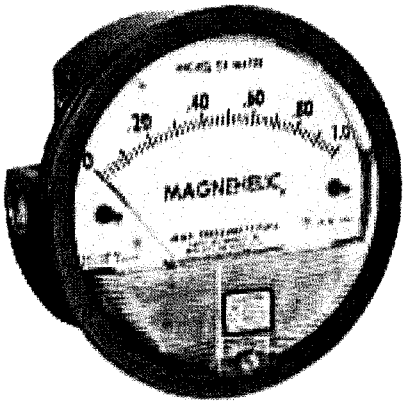
BULLETIN NO. **A-27**

Magnehelic® Differential Pressure Gage

OPERATING INSTRUCTIONS



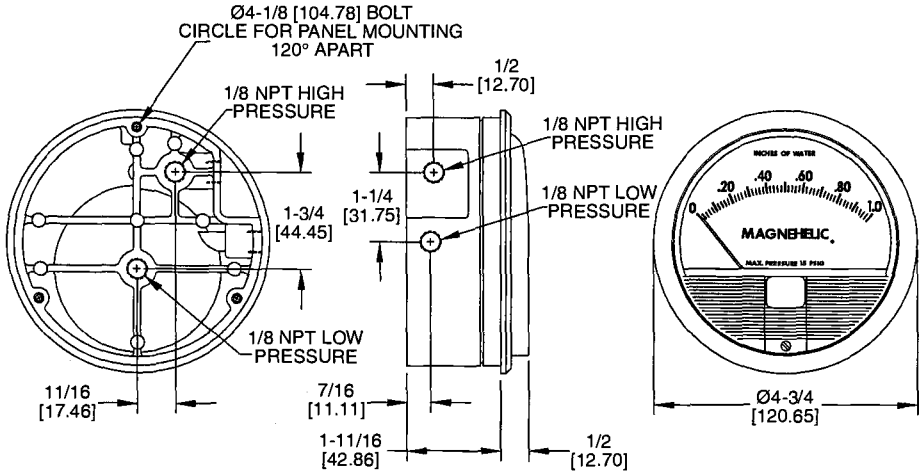
SPECIFICATIONS

Dimensions: 4-3/4" dia. x 2-3/16" deep.
Weight: 1 lb. 2 oz.
Finished: Baked dark gray enamel.
Connections: 1/8" NPT high and low pressure taps, duplicated, one pair side and one pair back.
Accuracy: Plus or minus 2% of full scale, at 70°F. (Model 2000-0, 3%; 2000-00, 4%).
Pressure Rating: 15 PSI (0,35 bar)
Ambient Temperature Range: 20° to 140°F (-7 to 60°C).
Standard gage accessories include two 1/8" NPT plugs for duplicate pressure taps, two 1/8" NPT pipe thread to rubber tubing adapters, and three flush mounting adapters with screws.

Caution: For use with air or compatible gases only.

For repeated over-ranging or high cycle rates, contact factory.

Not for use with Hydrogen gas. Dangerous reactions will occur.



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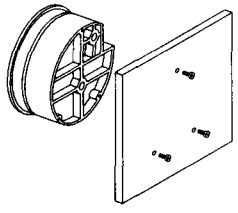
Lit-by-Fax: 888/891-4963

MAGNEHELIC® INSTALLATION

1. Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F. Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines my be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.

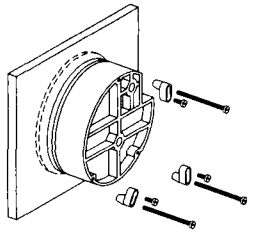
2. All standard Magnehelic gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range Model 2000-00 and metric equivalents must be used in the vertical position only.

3. Surface Mounting



Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

4. Flush Mounting



Provide a 4-9/16" dia. opening in panel. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place. To mount gage on 1-1/4"-2" pipe, order optional A-610 pipe mounting kit.

5. To zero the gage after installation

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

Operation

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.

Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.

Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.

When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with rubber or Tygon tubing.

B. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended. See accessory bulletin S-101 for fittings.

Ordering Instructions:

When corresponding with the factory regarding Magnehelic® gage problems, be sure to include model number, pressure range, and any special options. Field repair is not recommended; contact the factory for repair service.

MAINTENANCE

Maintenance: No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves, (bulletin S-101), should be used in permanent installations.

Calibration Check: Select a second gage or manometer of known accuracy and in an appropriate range. Using short lengths of rubber or vinyl tubing, connect the high pressure side of the Magnehelic gage and the test gage to two legs of a tee. Very slowly apply pressure through the third leg. Allow a few seconds for pressure to equalize, fluid to drain, etc., and compare readings. If accuracy unacceptable, gage may be returned to factory for recalibration. To calibrate in the field, use the following procedure.

Calibration:

1. With gage case, held firmly, loosen bezel, by turning counterclockwise. To avoid damage, a canvas strap wrench or similar tool should be used.
2. Lift out plastic cover and "O" ring.
3. Remove scale screws and scale assembly. Be careful not to damage pointer.
4. The calibration is changed by moving the clamp. Loosen the clamp screw(s) and move slightly toward the helix if gage is reading high, and away if reading low. Tighten clamp screw and install scale assembly.
5. Place cover and O-ring in position. Make sure the hex shaft on inside of cover is properly engaged in zero adjust screw.
6. Secure cover in place by screwing bezel down snug. Note that the area under the cover is pressurized in operation and therefore gage will leak if not properly tightened.
7. Zero gage and compare to test instrument. Make further adjustments as necessary.

Caution: If bezel binds when installing, lubricate threads sparingly with light oil or molybdenum disulphide compound.

Warning: Attempted field repair may void your warrenty. Recalibration or repair by the user is not recommended. For best results, return gage to the factory. Ship prepaid to:

Dwyer Instruments, Inc.

Attn: Repair Dept.

102 Indiana Highway 212

Michigan City, IN 46360

Trouble Shooting Tips:

•*Gage won't indicate or is sluggish.*

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O"ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F, order gage with low temperature, (LT) option.

•Pointer stuck-gage can't be zeroed.

1. Scale touching pointer.
2. Spring/magnet assembly shifted and touching helix.
3. **Metallic particles clinging to magnet and interfering with helix movement.**
4. Cover zero adjust shaft broken or not properly engaged in adjusting screw.

We generally recommend that gages needing repair be returned to the factory. Parts used in various sub-assemblies vary from one range of gage to another, and use of incorrect components may cause improper operation. After receipt and inspection, we will be happy to quote repair costs before proceeding.

Consult factory for assistance on unusual applications or conditions.

Use with air or compatible gases only.

 Printed in U.S.A. 4/01 FR# 12-440212-00 Rev. 3

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361 U.S.A.
Phone: 219/879-8000 www.dwyer-inst.com
Fax: 219/872-9057 e-mail: info@dwyer-inst.com
Lit-by-Fax: 888/891-4963

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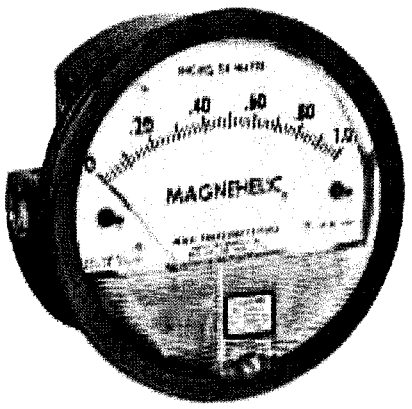
BULLETIN NO. **A-27**

Manometro Diferencial Magnehelic®

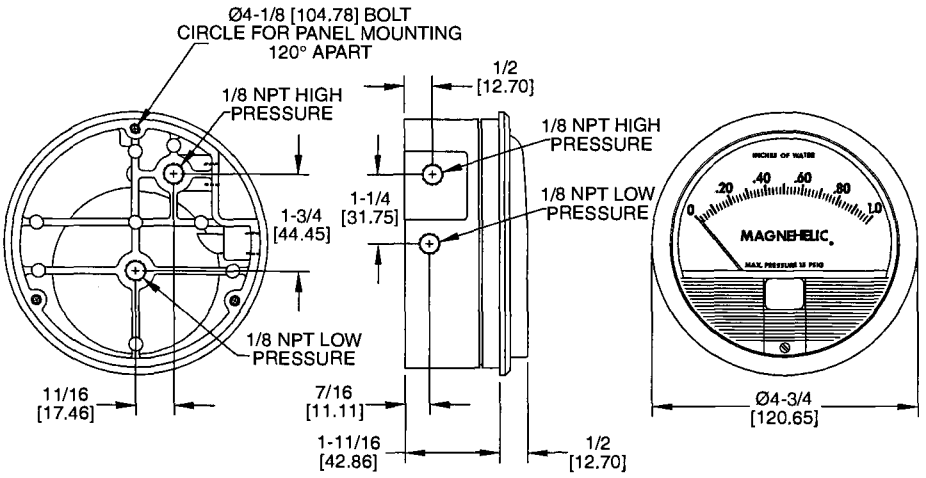
INSTRUCCIONES Y LISTA DE PARTES



ESPECIFICACIONES

Dimensiones: diám. 120,65 mm x 55,6 prof.
Peso: 509 g.
Terminación: esmalte horneado gris oscuro.
Conexiones: 1/8″ NPT para alta y baja presión, duplicadas (atrás, a los lados).
Exactitud: ± 2% de fondo de escala a 21 °C
Mod. 2000-0 3%; Mod. 2000-00 4%
Presión máxima: 15 PSI (0,35 bar)
Temperatura: -7 a +60°C
Accesorios: Tapones 1/8″ NPT para las conexiones duplicadas, dos adaptadores de rosca 1/8″ NPT a tubo de goma; y tres adaptadores para montaje al ras y tornillos.

Atencion: solo para uso con aire o gases compatibles.
Para indicaciones de sobrerango repetidas u otras contacte a Fábrica.
Precaución para uso con hidrogeno: el imán del instrumento puede en presencia de hidrógeno liberar gases tóxicos y explosivos. Para este caso, consulte a fábrica.



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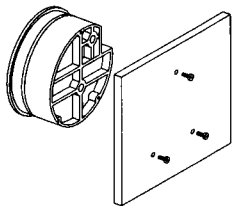
INSTALACIÓN

1. Seleccione un lugar libe de exceso de vibraciones, y donde la temperatura ambiente no supere los 60°C. Evite luz solar directa, para evitar decoloración de la cubierta plástica. Las conexiones de proceso pueden tener cualquier longitud sin afectar la exactitud, pero pueden extender el tiempo de respuesta del instrumento. Si hay pulsación de presión o vibración, consulte a fábrica sobre medios de amortiguación.

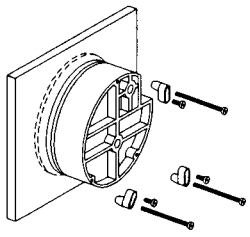
2. Los MAGNEHELIC han sido calibrados con el diafragma vertical, y deben ser usados en esas condiciones. Para otras posiciones, se debe especificar en la orden de provisión. Los de rango elevado pueden ser usados en diversas posiciones, pero se debe reajustar el cero. Los modelos de la serie 2000-00 y equivalentes métricos deben ser usados solo verticalmente.

3. Montaje en Superficie



Perfore tres orificios separados 120° sobre una circunferencia de 105 mm de diám. y sostenga el instrumento con tres tornillos 6-32 de long. apropiada.

4. Montaje al Ras



Perfore un circulo de 115 mm de diám. en el panel, y sostenga el instrumento mediante los. Para montaje sobre caño, ordene el adaptador A-610 apto para caños de 32 a 50 mm de diám.

5. Puesta a Cero Después de Instalar

Deje las conexiones de presión abiertas a atmósfera y ajuste a cero desde tornillo del panel frontal.

Operacion

Presión Positiva: Conecte la tubería desde la fuente de presión a cualquiera de las dos conexiones de alta presión (HIGH), bloqueando la no usada; Las conexiones de baja (LOW) presión pueden dejarse uno o los dos abiertos a la atmósfera.

Presión Negativa: Repita el procedimiento anterior, conectado en este caso las conexiones de baja presión (LOW). Deje las otras conexiones abiertas.

Presión diferencial: Conecte el tubo correspondiente a la presión más positiva al cualquiera de los conectores de alta presión (HIGH) bloqueando el no usado, y la más baja presión o presión negativa (vacío) al conector de baja presión (LOW). Puede usarse cualquier conector de cada par, dejando siempre uno bloqueado. Si se deja una conexión abierta a la atmósfera, se recomienda el uso de un filtro tipo A-331 en el lugar correspondiente para mantener limpio el interior del instrumento. Para uso portable, o instalación temporaria, uso adaptadores para rosca de tubo de 1/8" a tubo flexible, y conecte a proceso mediante una tubería de goma o Tygon, o equivalente. Para instalación permanente, se recomienda el uso de tubo de cobre o aluminio de por lo menos 1/4" de diám. exterior. Vea el boletín S-101 para accesorios.

MANTENIMIENTO

No se requiere mantenimiento específico alguno, ni lubricación. Periódicamente, desconecte el instrumento, ventee la presión acumulada, y reajuste el cero. Para instalaciones permanentes, se debe usar un juego de válvulas de montaje permanente para el venteo (vea Bol. S-101).

Verificación de Calibración: Desconecte el instrumento de proceso, ventee a atmósfera y deje escurrir condensados. Utilice un manómetro de calidad y exactitud conocidas, y de rango adecuado. Conecte ambos instrumentos en paralelo mediante una T de conexión, y aplique presión lentamente para igualar presiones y eliminar condensados si los hubiera. Compare las lecturas. En caso de discrepancias, el instrumento deberá ser recalibrado en fábrica. Para calibración en campo, siga el siguiente procedimiento.

1. Sujete firmemente la caja del instrumento, y afloje mediante una llave adecuada el anillo de retención de la máscara del mismo. Preste atención de no dañar las partes del mismo.
2. Remueva el frente de plástico y el "O" ring de sello.
3. Desmonte los tornillos de la escala, y la escala con cuidado de no dañar la aguja indicadora.
4. La calibración se efectúa moviendo la traba luego de aflojarla. El movimiento de la misma hacia el helicoide corrige la indicación en exceso y viceversa. Reapriete a traba e instale nuevamente la escala.
5. Rearme el instrumento a su condición original. Preste atención a que el eje hexagonal interno (de ajuste a cero) esté posicionado correctamente frente al tornillo de puesta a cero.
6. Coloque la cubierta en posición y apriete hasta fijar. La cubierta sella la cámara de presión del instrumento, por lo que en funcionamiento puede haber pérdidas de no ser adecuadamente colocada.
7. Ajuste a cero y verifique la calibración. Repita el procedimiento según sea necesario.

Atención: Si el anillo de retención se traba al recolocar, lubrique ligeramente con aceite liviano o compuesto de disulfuro de molibdeno.

Cuidado! : La recalibración en campo puede invalidar la garantía. No se recomienda la recalibracion por parte del usuario. En caso necesario envie el instrumento con transporte pago a:

Dwyer Instruments, Inc.
Attn: Repair Department
102 Indiana Highway 212
Michigan City, IN 46360

Localización De Fallas

• *El instrumento no indica, o es lento en reacción.*

1. Conexión duplicada abierta.
2. Diafragma roto por sobrepresión.
3. Tubería de conexión perforada, con pérdidas o pinchazos.
4. Anillo de retención flojo, u "O " ring dañado.
5. Conexión a proceso indebida o inadecuada.
6. Temperatura muy baja. Para este caso ordene tipos LT (baja temperatura).

• *Aguja indicadora fija; Puesta a cero imposible.*

1. La escala esta en contacto con la aguja.
2. El conjunto imán/resorte están en contacto.
3. Hay partículas metálicas adheridas al imán y bloquean la helicoide.
4. Eje de ajuste a cero de la cubierta roto, o montado en forma incorrecta.

Se recomienda en general abstenerse de efectuar la recalibración o reparación en campo, y en cambio enviar el instrumento a fábrica para su reparación. Las partes usadas en cada subconjunto varían de acuerdo al modelo y rango, por lo que es factible el uso incorrecto de partes que darán lugar a resultados erróneos, o fallas inesperadas.

Los instrumentos enviados a fábrica son reparados a nuevo, y nos complacerá enviar un presupuesto de la reparación antes de la misma, previa la inspección del material remitido.

Consulte a fábrica para aplicaciones inusuales o especiales. Utilice estos manómetros solamente con aire o gases compatibles.

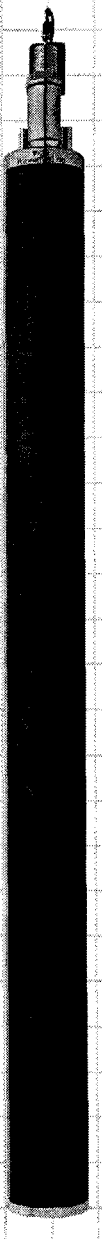
SVE Well Dewatering System Equipment Manuals

HHP4B

AutoPump®

Bottom Inlet HammerHead Pro

Max. Flow	13.5 gpm (51.1 lpm)
O.D.	3.5 in (8.9 cm)
Length	51 in. (129.5 cm)



Description

The HHP4B Bottom Inlet HammerHead Pro AutoPump provides economy and high flow in a bottom inlet pump for 4" (100 mm) diameter and larger wells in most remediation and landfill pumping applications, and delivers flow rates up to 13.5 gpm (51 lpm). The HHPro Bottom Inlet AutoPump is complemented by the most comprehensive selection of accessories to provide a complete system to meet site specific requirements. Call QED for prompt, no-obligation assistance on your pumping project needs.

The AutoPump Heritage

The HHP4B Bottom Inlet HammerHead Pro AutoPump is part of the famous AutoPump family of original automatic air-powered pumps, developed in the mid 1980s specifically to handle unique pumping needs at remediation and landfill sites. Over the years they've proven their durability at thousands of sites worldwide. AutoPumps are designed to handle difficult pumping challenges that other pumps can't, such as hydrocarbons, solvents, suspended solids, corrosives, temperature extremes, viscous fluids and frequent start/stop cycles. Beyond just the pump, AutoPump systems offer the most complete range of tubing, hose, connectors, wellhead caps and accessories to help your installation go smoothly. This superior pumping heritage, application experience and support back up every AutoPump you put to work on your project.

Advantage

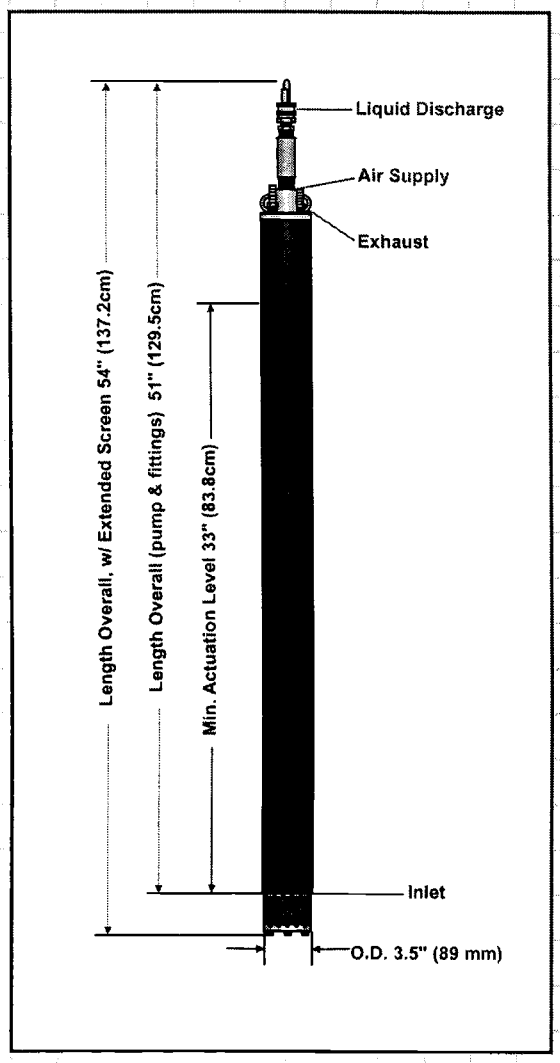
1. **Delivers higher flow rates than all competitive pumps**
2. **Outstanding value in a high reliability, high durability pump**
3. **Easier to service and lighter weight than other 4" pumps**
4. **Handles solids, solvents, hydrocarbons and landfill liquids**
5. **Three-year warranty**

AutoPump®

Bottom Inlet HammerHead Pro

HHP4B

Pump Dimensions



Specifications & Operating Requirements

Model	4" Bottom Inlet HammerHead Pro
Liquid Inlet Location	Bottom
OD	3.5 in. (8.9 cm)
Length Overall (pump & fittings)	51 in. (129.5 cm)
Length Overall, w / Extended Screen	54 in. (137.2 cm)
Weight	15 lbs. (6.8 kg)
Max. Flow Rate	13.5 gpm (51.1 lpm) - See Flow Rate Chart
Pump Volume / Cycle	0.58 - 0.66 gal (2.2 - 2.5L)
Max. Depth	250 ft. (76 m)
Air Pressure Range	5 - 120 psi (0.35 - 8.4kg/cm2)
Min. Actuation Level	33 in. (83.8 cm)
Air Usage	0.4 - 1.1 scf / gal. (2.4 - 8.4 liter of air / fluid liter) See Air Usage Chart
Min. Liquid Density	0.7 SpG (0.7 g/cm3)
Standard Construction Materials	
Pump Body	Fiberglass
Pump Ends	Stainless Steel, UHMWPE[2]
Internal Components	Stainless Steel, UHMWPE, Viton, Acetal
Tube & Hose Fittings	Brass or Stainless Steel
Fitting Type	Barb or Quick Connect
Tube & Hose Options	
Tubing Material	Nylon
Sizes[1] - Liquid Discharge	1 in. (25 mm) or 1-1/4 in. (32 mm) OD
Pump Air Supply	1/2 in. (12 mm) OD
Air Exhaust	5/8 in. (16 mm) OD
Hose Material	Nitrile
Sizes - Liquid Discharge	3/4 in. (19 mm) or 1 in. (25 mm) ID
Pump Air Supply	3/8 in. (9 mm) ID
Air Exhaust	1/2 in. (12 mm) ID

[1] Applies to QED supplied tubing; other tubing sources may not conform to QED fittings.

[2] UHMWPE - Ultra-high Molecular Weight Polyethylene

Application Limits

The HHP4B Bottom, Inlet HammerHead Pro is designed to handle the application ranges described below. For applications outside this range, choose the appropriate AP4 model.

Maximum Temperature: 150° F (65° C)
pH Range: 4-9
Solvents and Fuels: diesel, gasoline, JP1-JP6, #2 heating oil, BTEX, MTBE, landfill liquids

HammerHead Pro Pumps are warranted for three (3) years: 100% materials and workmanship.

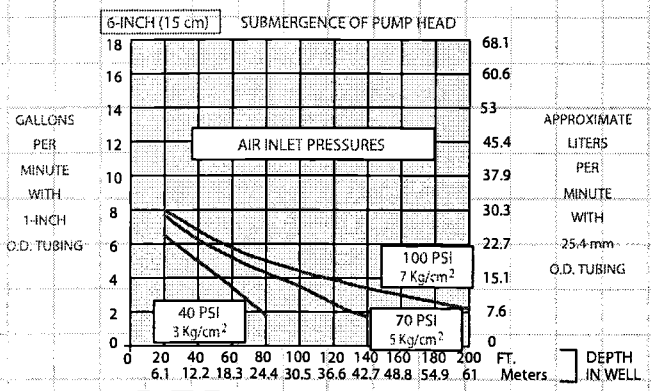
P.O. Box 3726 Ann Arbor, MI 48106-3726 USA 1.800.624.2026 F 1.734.995.1170 info@qedenv.com www.qedenv.com

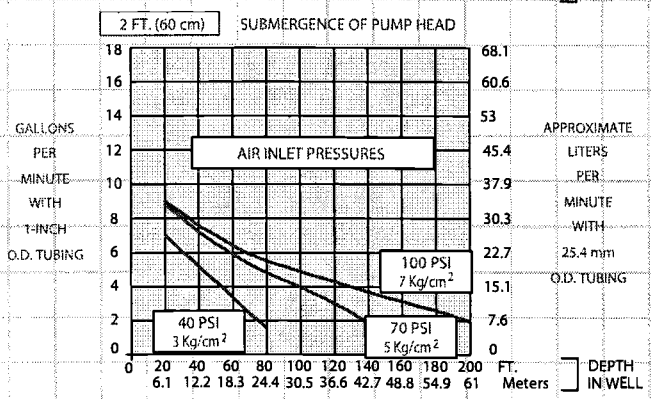
HHP4B AutoPump®

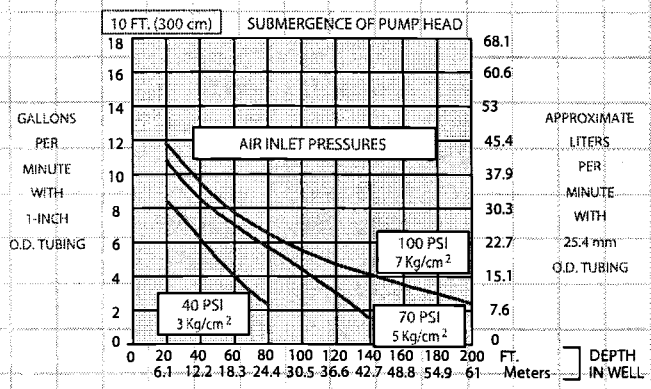
Bottom Inlet HammerHead Pro

Flow Rates[1]

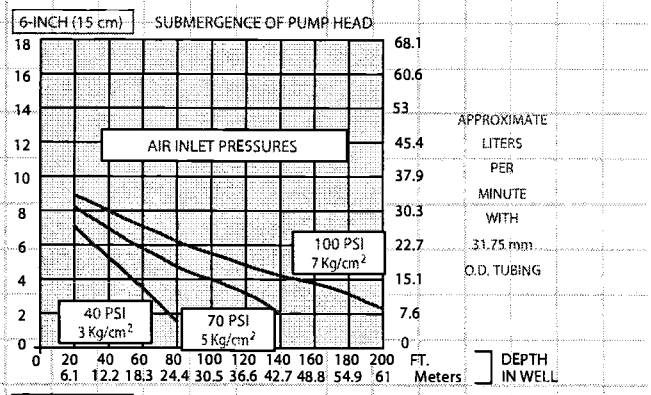
3/4 inch (19 mm) Inside Diameter Discharge Hose
(Equivalent to 1-Inch O.D. Tubing)

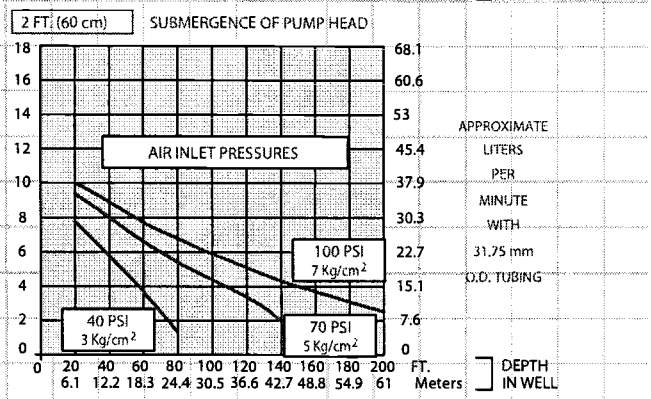


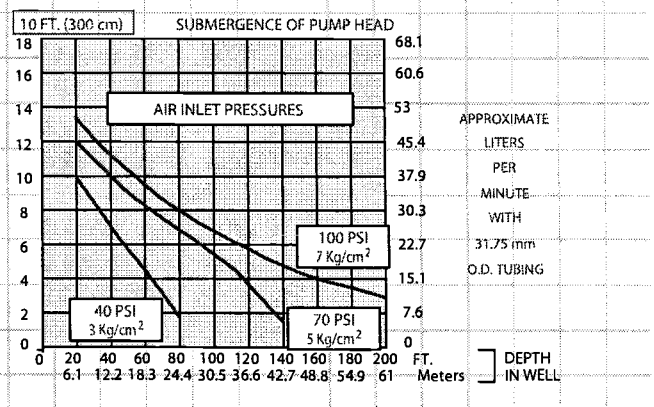




1 inch (25.4 mm) Inside Diameter Discharge Hose
(Equivalent to 1.25-Inch O.D. Tubing)







[1] FLOW RATES MAY VARY WITH SITE CONDITIONS. CALL QED FOR TECHNICAL ASSISTANCE.

SEVERN TRENT ▼QED

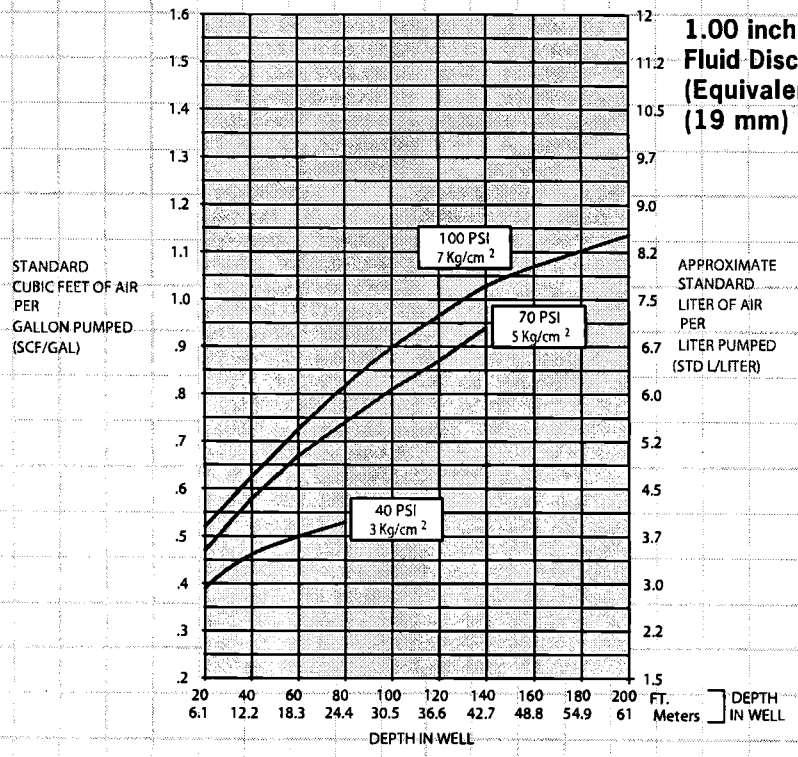
AutoPump®

Bottom Inlet HammerHead Pro

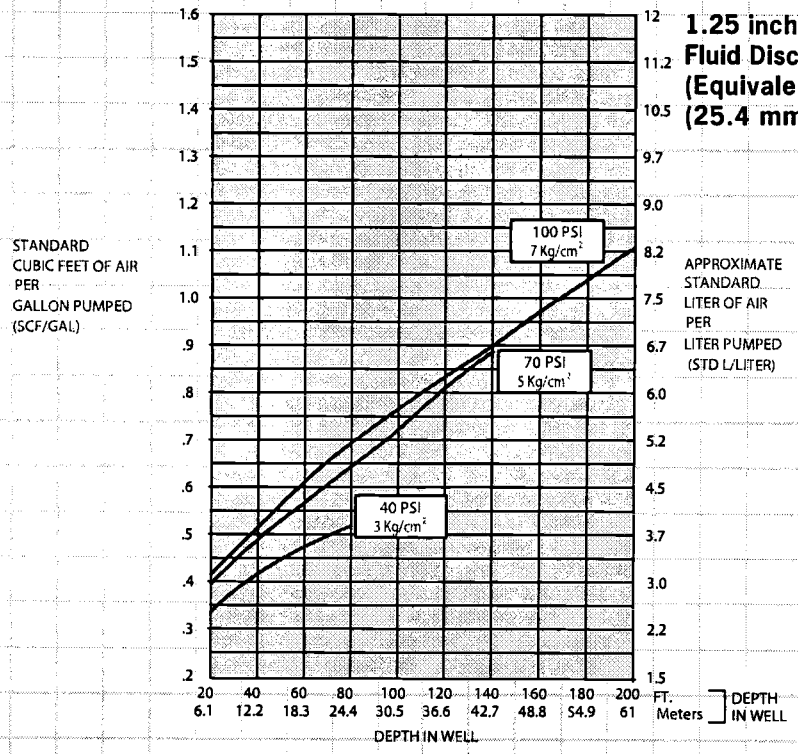
HHP4B

Air Consumption

1.00 inch (25.4 mm) O.D. Fluid Discharge Tubing (Equivalent to 3/4-inch I.D. (19 mm) Hose)



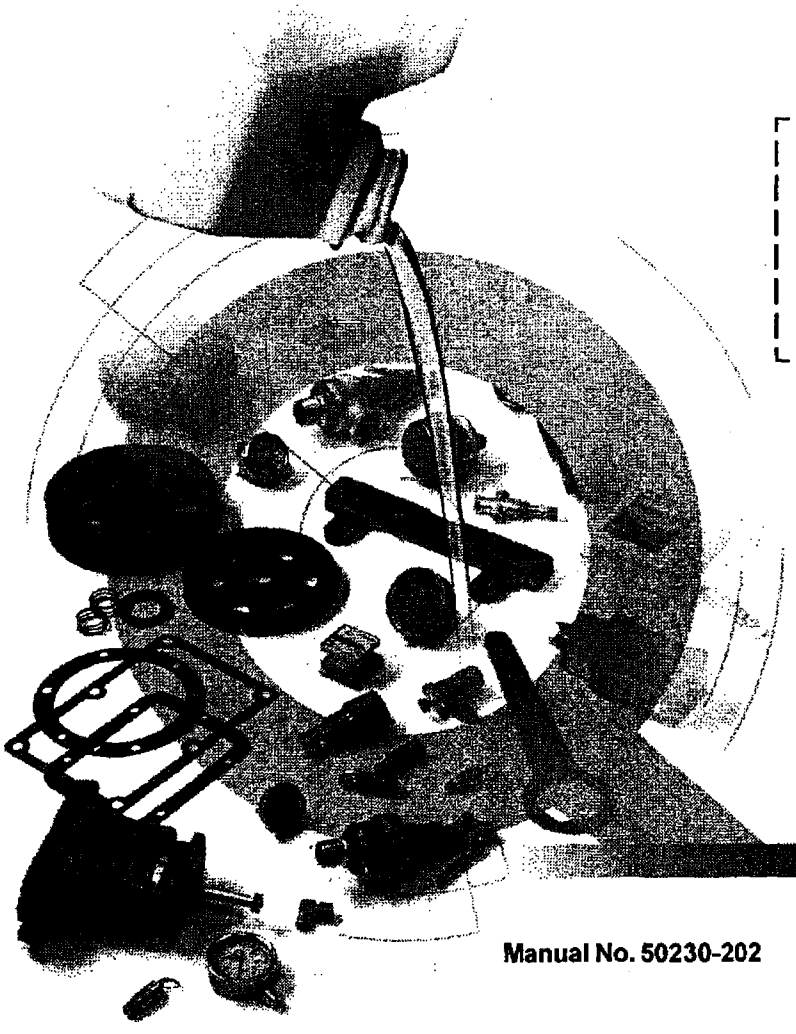
1.25 inch (32 mm) O.D. Fluid Discharge Tubing (Equivalent to 1- inch I.D. (25.4 mm) Hose)



P.O. Box 3726 Ann Arbor, MI 48106-3726 USA 1.800.624.2026 F 1.734.995.1170 info@qedenv.com www.qedenv.com

QT-5 Industrial & Air Master

Parts Manual · Record of Change 202



This manual contains important safety information and should be made available to all personnel who operate and/or maintain this product. Carefully read this manual before attempting to operate or perform maintenance on this compressor.

Fill Out & Return
Warranty Registration Card Located Inside

Quincy Compressor®

True Blue Reliability™

Manual No. 50230-202

May 2002 Edition

TABLE OF CONTENTS

INTRODUCTION

This manual provides information for the Model QT-5 reciprocating compressor, per Record of Change 202.

The Model QT-5 is an aircooled, two stage, two cylinder, splash lubricated compressor, with up to 175 PSI continuous pressure capability. It has a 4" low pressure bore and a 2.25" high pressure bore, with a 3" stroke. This compressor can be run at 400-1060 RPM.

A hooded air filter/silencer is available as an option, as well as head unloaders.

CHANGES

since previous printing dated May 2001:

Consolidated Quincy and Air Master QT-5 products into one book.

SERIAL NUMBER IDENTIFICATION

The unit serial number identification tag is located on the air tank top plate. The basic compressor serial number decal is located on the side of the crankcase opposite the oil fill side. *Fill in the numbers from your compressor unit and basic compressor in the corresponding spaces provided here, and reference this page when ordering replacement parts.*

Unit Serial Number

_____

Basic Serial Number

_____

All replacement parts are to be ordered through an authorized Quincy distributor. Insist on genuine Quincy parts only! Failure to do so may void warranty.

ORDERING REPLACEMENT PARTS

Prompt service can be rendered on repair parts orders if the following information is given:

Item 1) the model number, record of change number, & serial number.

Item 2) the exact part number needed. (Do not order by item numbers.)

Item 3) the exact quantity needed.

Item 4) the preferred type of transportation.

CRANKCASE LUBRICANT CAPACITY

Model	Capacity
QT-5	$1\frac{5}{8}$ qts. (1.5 lit.)

QUIN-*CIP* OIL

Refer to the chart below to order QUIN-*CIP* compressor oil from your local authorized Quincy distributor.

Package	Part No.	Description
Barrel	112541D032	55 gal., SAE 10W
Pail	112541P032	5 gal., SAE 10W
Gallon	112541G032	1 gal., SAE 10W
Gallon Case	112541X032	(4)-1 gal., SAE 10W
Quart	112541Q032	1 qt., SAE 10W
Quart Case	112541C032	(12)-1 qt., SAE 10W
Barrel	112542D068	55 gal., SAE 20
Pail	112542P068	5 gal., SAE 20
Gallon	112542G068	1 gal., SAE 20
Gallon Case	112542X068	(4)-1 gal., SAE 20
Quart	112542Q068	1 qt., SAE 20
Quart Case	112542C068	(12)-1 qt., SAE 20
Barrel	112543D100	55 gal., SAE 30
Pail	112543P100	5 gal., SAE 30
Gallon	112543G100	1 gal., SAE 30
Gallon Case	112543X100	(4)-1 gal., SAE 30
Quart	112543Q100	1 qt., SAE 30
Quart Case	112543C100	(12)-1 qt., SAE 30

CAUTION !

Refer to the QT & PLT Industrial / Air Master Series instruction manual for vital lubrication information.

CAUTION !

Follow all safety precautions outlined in the QT & PLT Industrial / Air Master Series instruction manual.

WARNING !

Do not operate this compressor without a totally enclosed belt guard or any other required safety equipment.

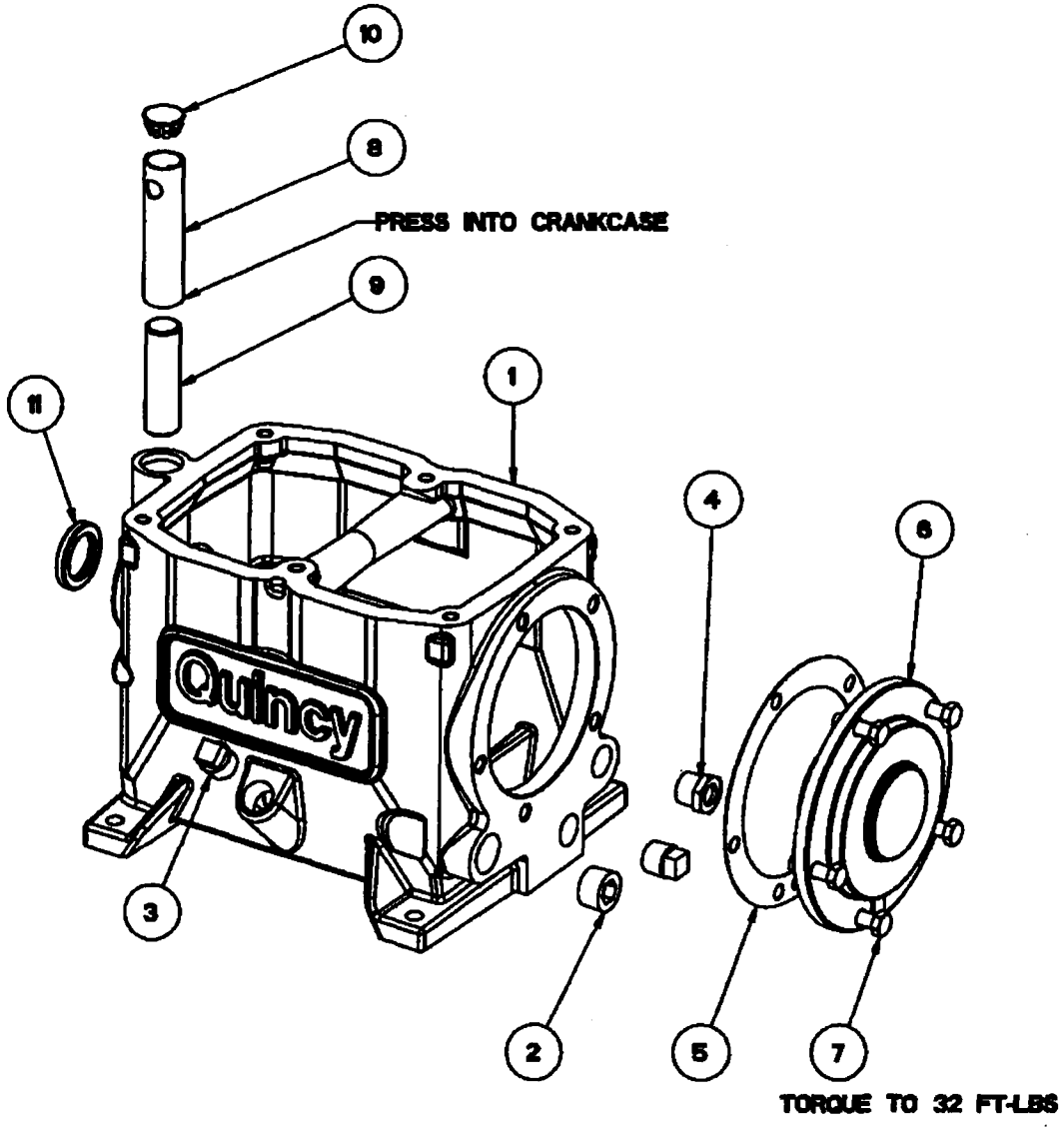
DANGER !

Air used for breathing or food processing must meet OSHA 1910.134 or FDA 21 CFR 178.3570 regulations. Failure to do so may cause severe injury or death.

CRANKCASE GROUP 113683

Item Number	Qty.	Part Number	Description
1	1	113940	crankcase
* 2	1	2276	pipe plug, 3/4 npt
3	2	2057	pipe plug, 1/2 npt
* 4	1	113736-050	sight glass, 1/2 npt
5	1	113755	gasket, bearing carrier
6	1	113942	bearing carrier
7	6	115037-L14	hex. screw, 3/8-16 unc x 1.25, grade 5, with sealant
8	1	113947	breather tube
9	1	111333	crankcase breather
10	1	40825	blank
11	1	111106-001	oil seal

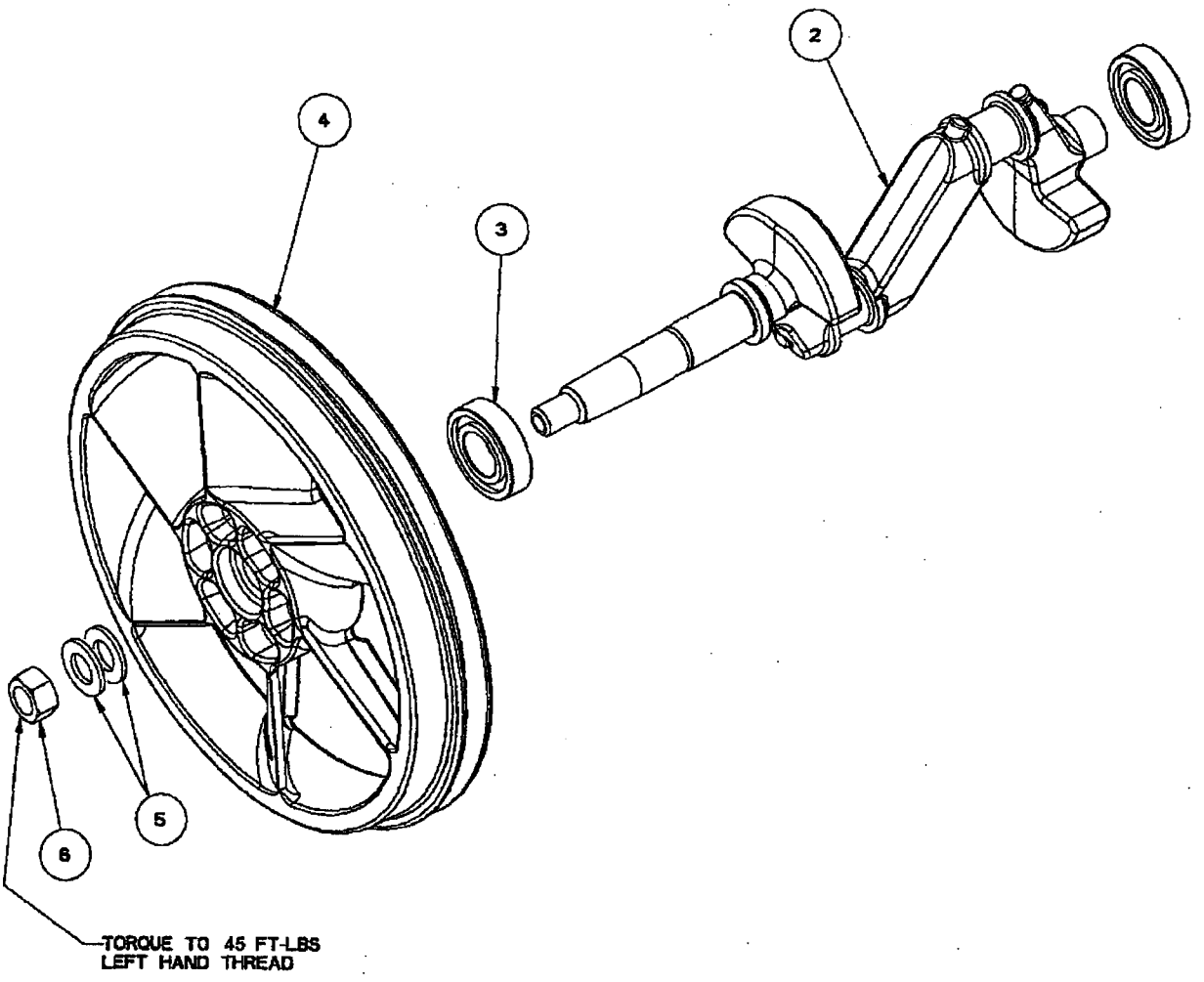
* Install with Teflon® tape.



CRANKSHAFT GROUP 113684*

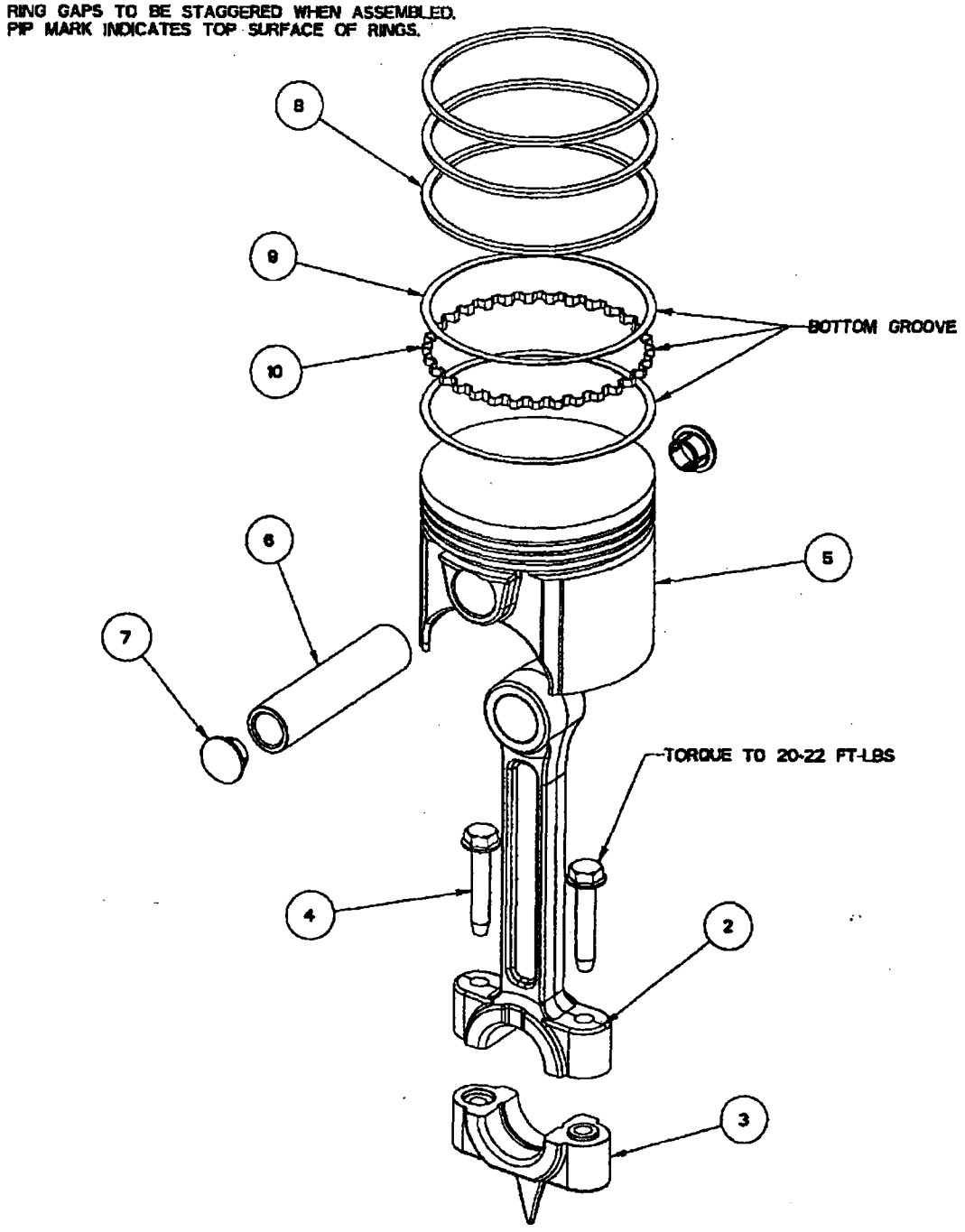
Item Number	Qty.	Part Number	Description
1	1	113602X	crankshaft assembly (includes items 2 & 3)
2	1	113602	crankshaft (N.S.S.; order 113602X)
3	2	111107	ball bearing
4	1	113944	sheave, 14.16 OD, 1 groove, B section, CCW rotation
	or		
4	1	113944-001	sheave, 14.16 OD, 2 groove, B section, CCW rotation
5	2	110428N075	flatwasher, 3/4
6	1	114041	hex. nut, 3/4 -16 unf, left hand thread

* 113684 = Crankshaft Group with 1 groove sheave
113684-006 = Crankshaft Group with 2 groove sheave
N.S.S. = Not Sold Separate



CONNECTING ROD & PISTON GROUP 113686

(low pressure)



CONNECTING ROD & PISTON GROUP 113686

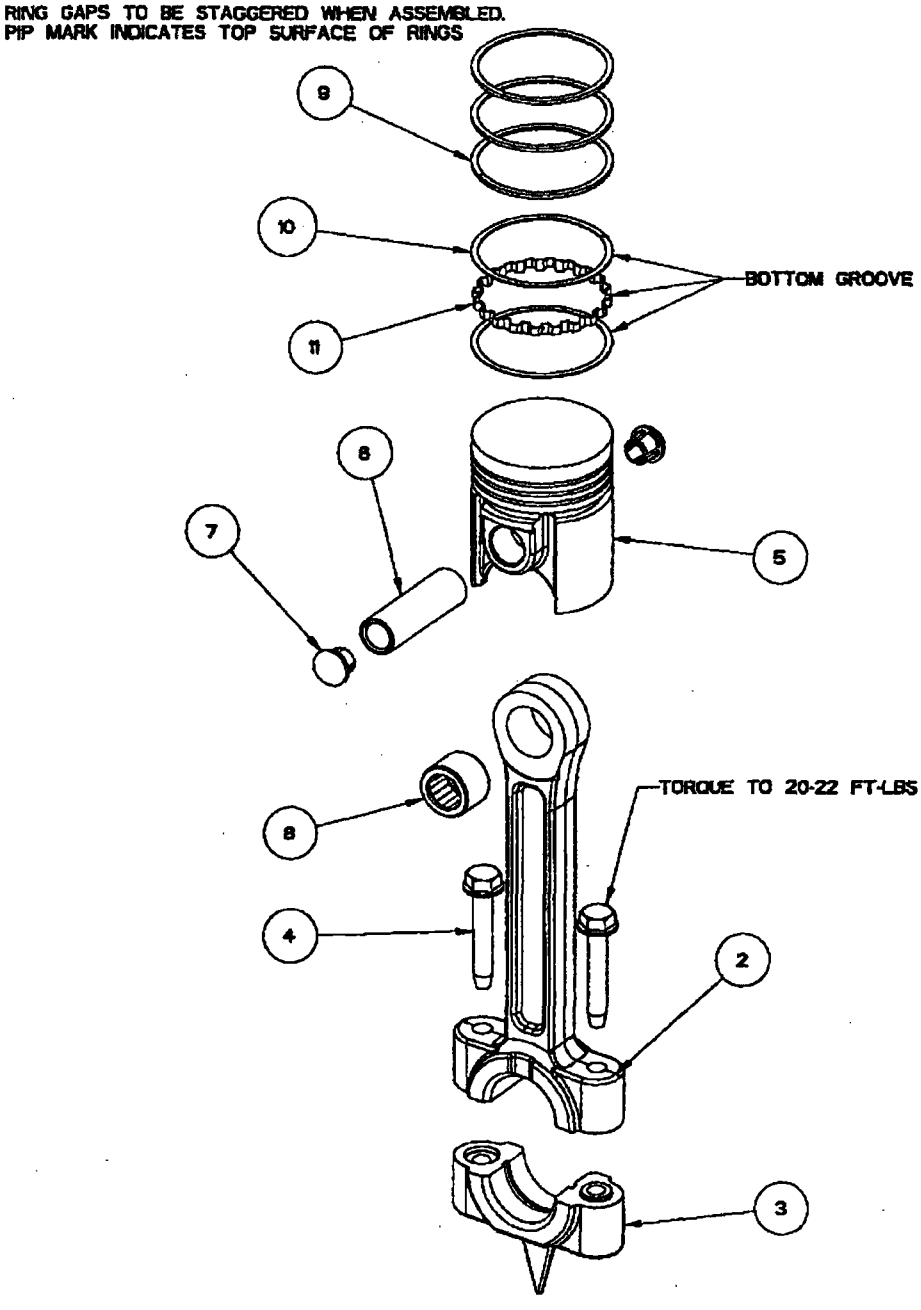
(low pressure)

Item Number	Qty.	Part Number	Description
1	1	113936-001	connecting rod assembly (includes items 2, 3 & 4)
2	1	113936R	connecting rod (N.S.S.; order 113936-001)
3	1	113937R	connecting rod cap (N.S.S.; order 113936-001)
4	2	110511-K16	taptite screw, 5/16-18 unc x 1.75
5	1	113609	piston, LP
6	1	110190-013	piston pin (N.S.S.; order 110190-050)
7	2	111105-001	piston pin plug
8	3	111330	piston ring
9	2	6591	piston rail
10	1	6590	expander oil ring
			Maintenance Parts
	1	113609-010	low pressure piston (.010 oversize)
		111199	**Piston Ring Set (standard)** includes all rings necessary for installing standard rings
		111199-010	**Piston Ring Set (.010 oversize)** includes all rings necessary for installing .010 oversize rings
		113609X	**Piston Assembly, LP (standard)** includes piston, ring set, piston pin & piston pin plugs
		113609X010	**Piston Assembly, LP (oversize)** includes piston, ring set, piston pin & piston pin plugs
		110190-050	**Replacement Piston Pin Assembly, LP** includes piston & plugs

N.S.S. = Not Sold Separate

CONNECTING ROD & PISTON GROUP 113687

(high pressure)



CONNECTING ROD & PISTON GROUP 113687

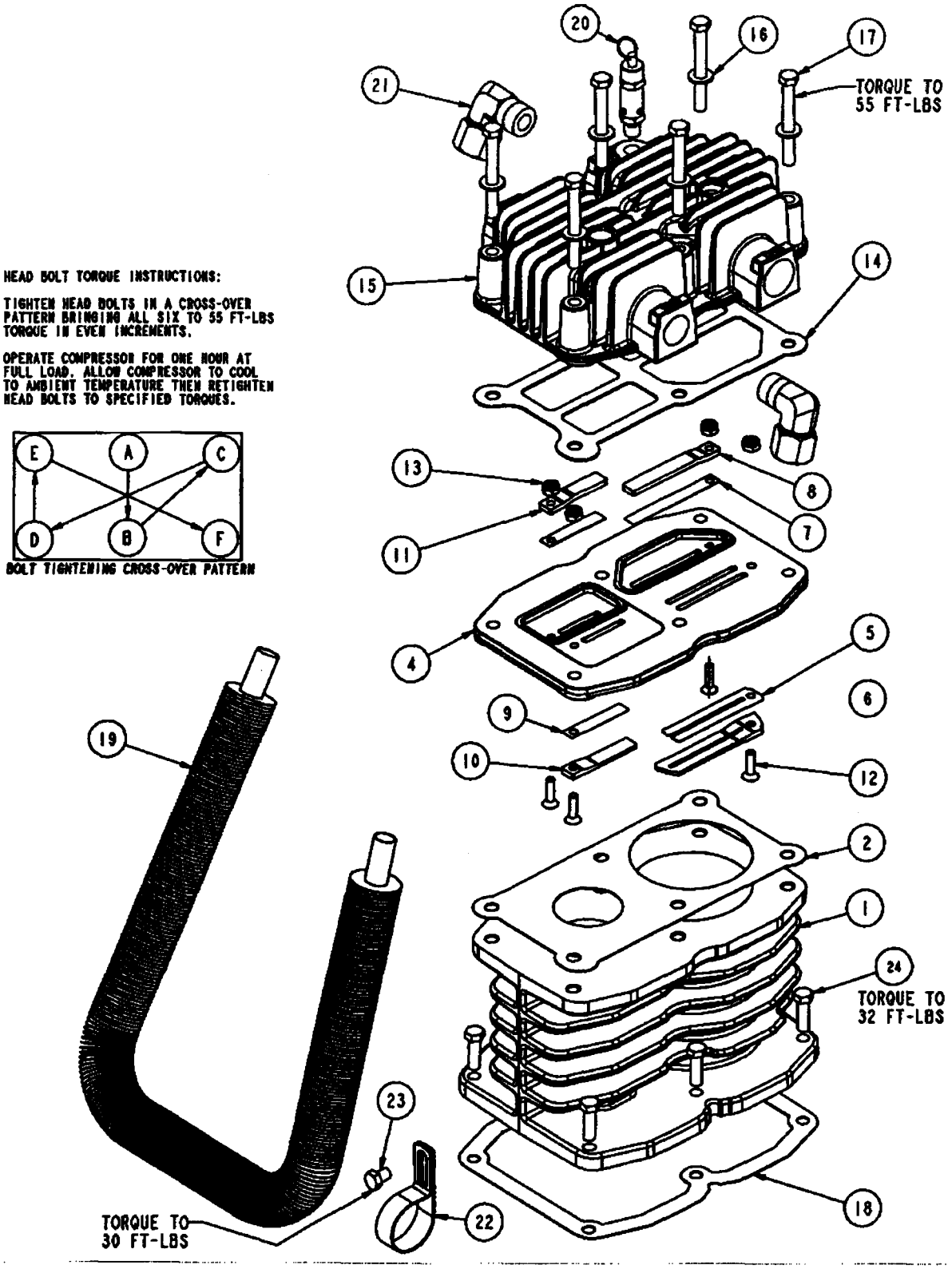
(high pressure)

Item Number	Qty.	Part Number	Description
1	1	113936-003	connecting rod assembly (includes items 2, 3, 4 & 8)
2	1	113936R	connecting rod (N.S.S.; order 113936-003)
3	1	113937R	connecting rod cap (N.S.S.; order 113936-003)
4	2	110511-K16	taptite screw, 5/16-18 unc x 1.75
5	1	113610	piston, HP
6	1	110190-014	piston pin (N.S.S.; order 110190-051)
7	2	111105-002	piston pin plug
8	1	111112	needle bearing
9	3	111114	piston ring
10	2	111124	oil ring rail
11	1	111123	oil ring expander
			Maintenance Parts
	1	113610-010	high pressure piston (.010 oversize)
		111200	**Piston Ring Set (standard)** includes all rings necessary for installing standard rings
		111200-010	**Piston Ring Set (.010 oversize)** includes all rings necessary for installing .010 oversize rings
		113610X	**Piston Assembly, HP (standard)** includes piston, ring set, piston pin & piston pin plugs
		113610X010	**Piston Assembly, HP (oversize)** includes piston, ring set, piston pin & piston pin plugs
		110190-051	**Replacement Piston Pin Assembly, HP** includes piston & plugs

N.S.S. = Not Sold Separate

CYLINDER & HEAD GROUP 113685

(less head unloaders)



CYLINDER & HEAD GROUP 113685

(less head unloaders)

Item Number	Qty.	Part Number	Description
1	1	113941	cylinder
2	1	113617	gasket, valve plate to cylinder
3	1	113946X	valve plate assembly
4	1	113946R	valve plate
5	1	112380	reed valve (N.S.S.; order 113946X)
6	1	112378-1	valve bumper (N.S.S.; order 113946X)
7	1	112359-1	reed valve (N.S.S.; order 113946X)
8	1	112381-1	valve bumper (N.S.S.; order 113946X)
9	2	112359-2	reed valve , (N.S.S.; order 113946X)
10	1	112379	valve bumper (N.S.S.; order 113946X)
11	1	112381-2	valve bumper (N.S.S.; order 113946X)
12	4	112728-J12	flathead screw, 1/4-20 unc x 1.00, grade 8
13	4	112373-J02	hex. nut, 1/4-20 unc
14	1	113618-002	gasket, valve plate to cylinder head
15	1	113613M001	cylinder head, plain
16	6	114595N038	hardened flatwasher, 3/8
17	6	114440-L22	hex. screw, 3/8-16 unc x 3.25, grade 9
18	1	113943	gasket, cylinder to crankcase
19	1	113606	intercooler (N.S.S.; order Intercooler Replacement Kit)
* 20	1	2961-100	pressure relief valve
* 21	2	110919-024	tube fitting, 90° male elbow, 3/4 tube x 3/4 npt
22	1	112225-2	intercooler clamp
23	1	123478-L07	hex. screw, 3/8-16 unc x .50, grade 5
24	6	115037-L14	hex. screw, 3/8-16 unc x 1.25, grade 5, with sealant
			Maintenance Parts
	1	**114096-002**	**Valve Assembly Replacement Kit** includes items 2, 3, 14, 16, 17 & instructions
	1	**113606K**	**Intercooler Replacement Kit** includes intercooler and nut / sleeve fittings

N.S.S. = Not Sold Separate

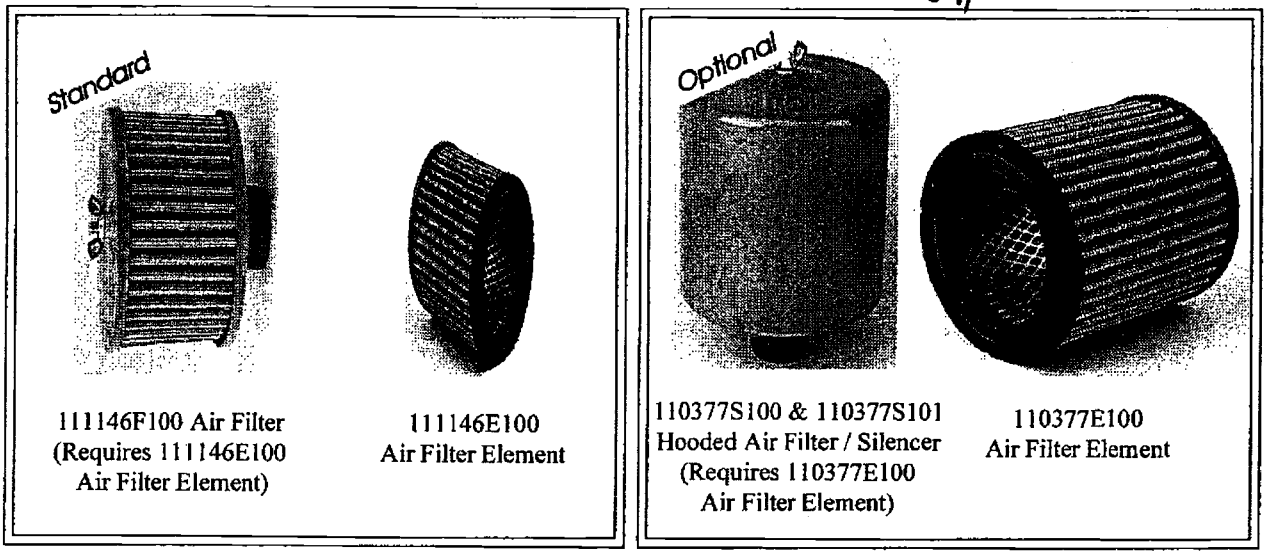
* Install with Teflon® tape.

Anthony fax (626) 444 1012

69 — 15 — Sq/

QT-5 AIR FILTERS

(for compressors without head unloaders)



111146F100 Air Filter (Requires 111146E100 Air Filter Element)

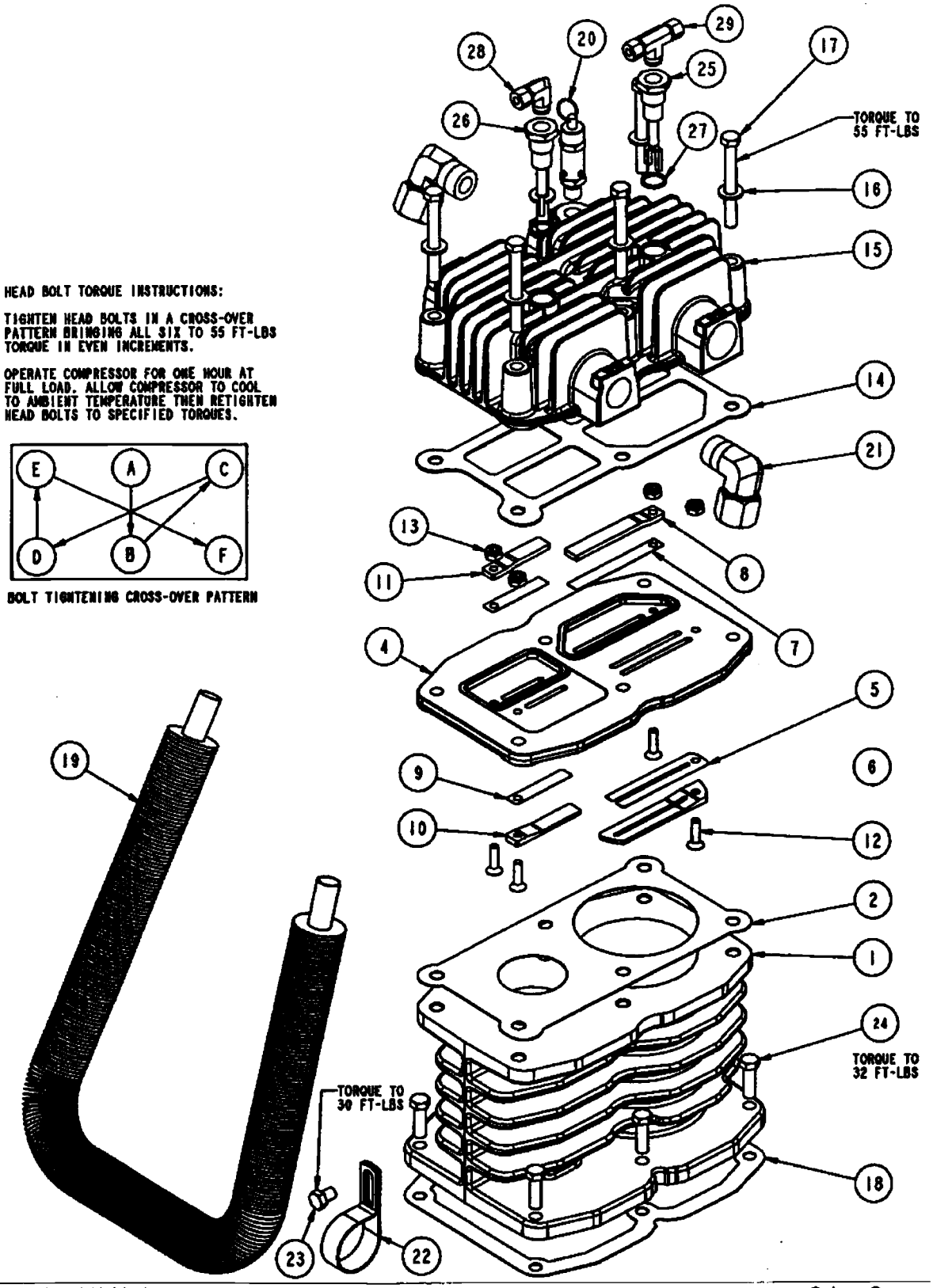
111146E100 Air Filter Element

110377S100 & 110377S101 Hooded Air Filter / Silencer (Requires 110377E100 Air Filter Element)

110377E100 Air Filter Element

CYLINDER & HEAD GROUP 113685-001

(with head unloaders)



CYLINDER & HEAD GROUP 113685-001

(with head unloaders)

Item Number	Qty.	Part Number	Description
1	1	113941	cylinder
2	1	113617	gasket, valve plate to cylinder
3	1	113946X	valve plate assembly
4	1	113946R	valve plate
5	1	112380	reed valve (N.S.S.; order 113946X)
6	1	112378-1	valve bumper (N.S.S.; order 113946X)
7	1	112359-1	reed valve (N.S.S.; order 113946X)
8	1	112381-1	valve bumper (N.S.S.; order 113946X)
9	2	112359-2	reed valve , (N.S.S.; order 113946X)
10	1	112379	valve bumper (N.S.S.; order 113946X)
11	1	112381-2	valve bumper (N.S.S.; order 113946X)
12	4	112728-J12	flathead screw, 1/4-20 unc x 1.00, grade 8
13	4	112373-J02	hex. nut, 1/4-20 unc
14	1	113618-002	gasket, valve plate to cylinder head
15	1	113613-001	cylinder head, plain
16	6	114595N038	hardened flatwasher, 3/8
17	6	114440-L22	hex. screw, 3/8-16 unc x 3.25, grade 9
18	1	113943	gasket, cylinder to crankcase
19	1	113606	intercooler (N.S.S.; order Intercooler Replacement Kit)
* 20	1	2961-100	pressure relief valve
* 21	2	110919-024	tube fitting, 90° male elbow, 3/4 tube x 3/4 npt
22	1	112225-2	intercooler clamp
23	1	123478-L07	hex. screw, 3/8-16 unc x .50, grade 5
24	6	115037-L14	hex. screw, 3/8-16 unc x 1.25, grade 5, with sealant
* 25	1	111591X1	unloader
* 26	1	111591X2	unloader
27	2	112708-908	"o"ring, silicone
* 28	1	2708	tube fitting, 90° male elbow, 1/4 tube x 1/4 npt
* 29	1	124351-004	tube fitting, male branch tee, 1/4 tube x 1/4 npt

Maintenance Parts

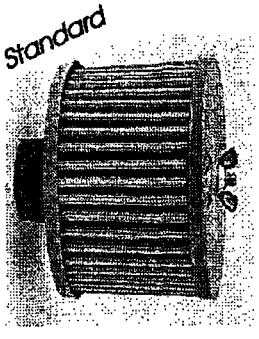
1	**114096-002**	**Valve Assembly Replacement Kit** includes items 2, 3, 14, 16, 17 & instructions
1	**113606K**	**Intercooler Replacement Kit** includes intercooler and nut / sleeve fittings

N.S.S. = Not Sold Separate

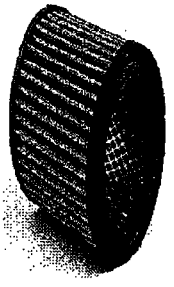
* Install with Teflon® tape.

QT-5 AIR FILTERS

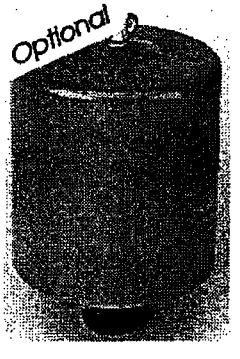
(for compressors with head unloaders)



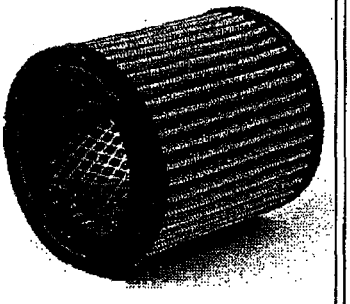
111549 Air Filter
(Requires 110377E075
Air Filter Element)



110377E075
Air Filter Element

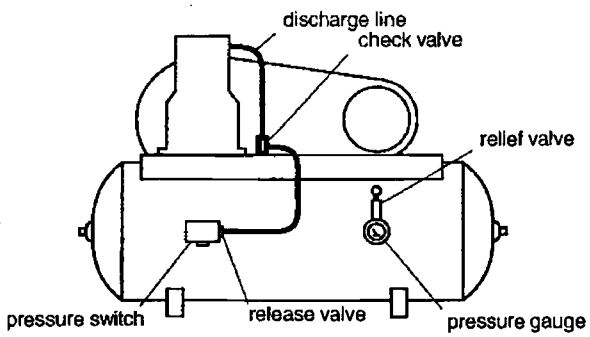


110377S100 & 110377S101
Hooded Air Filter / Silencer
(Requires 110377E100
Air Filter Element)



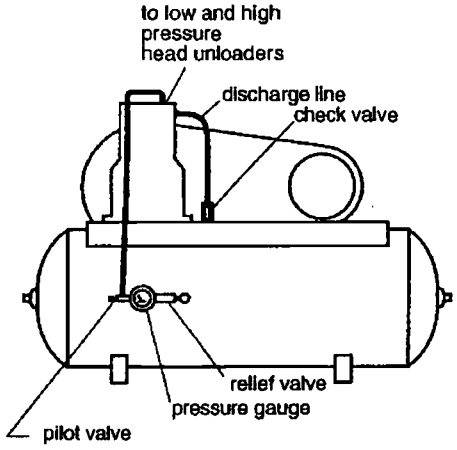
110377E100
Air Filter Element

CONTROL PIPING SCHEMATIC

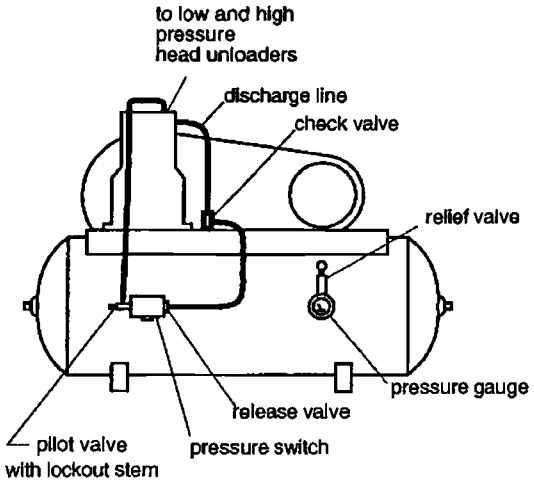


Control Piping
For Automatic Start/Stop

(with loadless starting)



Control Piping
For Continuous Run



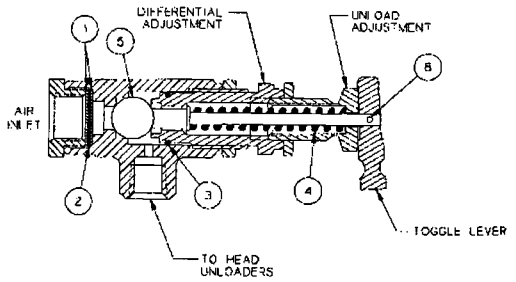
Control Piping
For Dual Control

Pilot valve is open (stem screwed out)

for Continuous Run operation
Pilot valve is closed (stem screwed in)

PIX 1186.eps

PILOT VALVES

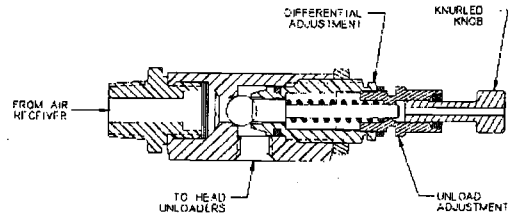


110832 Series Pilot Valve (continuous run operation)

Add dash # listed below to 110832 (per pressure setting) to obtain correct pilot valve.

Dash #	Load PSI	Unload PSI
-100	90	100
-997	*	30-70 adjustable
-998	*	71-150 adjustable
-999	*	151-175 adjustable

** Customer to set, see differential setting chart. Additional factory preset valves are available upon request.*



110998 Series Pilot Valve (dual control operation)

Add dash # listed below to 110998 (per pressure setting) to obtain correct pilot valve.

Dash #	Load PSI	Unload PSI
-115	100	115
-140	125	140
-165	150	165

Pilot Valve Repair Kit 110832-051

Can be used to repair 110832 series pilot valves only. Customer must specify which spring when ordering kit.

Item #	Qty.	Part Number	Description
1	2		screen
2	1		filter
3	1		"o"ring
4	1	see chart below	pilot valve spring
5	1		ball

Differential Setting Chart

Applies to 110998 series pilot valves only.

Unload (PSI)	Min. Dif. (PSI)	Max. Dif. (PSI)
40	2	5
60	3	10
100	4	20
150	5	30
175	5	45

Differential Setting Chart

Spring Part # (Item 4)	Unload (PSI)	Min. Dif. (PSI)	Max. Dif. (PSI)
110832-052 (red)	30	2	4
"	40	5	8
"	50	5	8
"	60	5	8
"	70	5	10
110832-053 (yellow)	80	5	10
"	90	5	12
"	100	5	13
"	110	5	15
"	120	5	15
"	130	5	18
"	140	5	18
"	150	5	20
110832-054 (green)	160	5	15
"	170	5	20
"	175	5	23

WARNING !

Not all pilots are for use with all compressor systems. Make sure that the pilot you order is set within the safe operating limits of your compressor. Failure to heed this warning could result in an explosion.

SUCTION VALVE UNLOADER ASSEMBLIES

Description

The Quincy suction valve unloader assembly consists of unloading assemblies on the suction valves, having a plunger to contact the suction valve reed and an unloader pilot valve (110832 or 110998 series) to automatically regulate the passing of air tank pressure to the unloading arrangement.

Continuous Run Operation

Suction valve unloader assemblies are recommended for use on Quincy compressors where the compressor is to run continuously and a constant pressure is to be maintained. The purpose is to automatically unseat the suction valve of the compressor when the air supply is greater than the demand.

Unloading occurs when air tank pressure is sufficient to overcome pilot valve spring pressure. The check ball is then unseated, allowing air tank pressure to pass to the unloader assemblies. The compressor will run unloaded until the air tank pressure drops to a predetermined level. At this time, the action of the ball is reversed, shutting off air tank pressure to the unloader assemblies and venting the unloader to atmosphere. This allows the compressor to load. The drive, either electric motor or engine, runs continuously and must be started and stopped manually. 110832 series pilot valves feature a toggle lever which can be flipped to provide manual unloading.

Dual Control Operation

Dual control operation is designed to provide a choice between "start/stop" or "continuous run" operation. The 110998 series pilot valve can be set for "start/stop" operation by turning the knurled knob at the end of the pilot valve *(refer to illustration for 110998 series pilot valve)* clockwise until it stops. Under these circumstances, a pressure switch is required to stop the motor. Failure to use a pressure switch, with the pilot valve locked out, will result in unsafe conditions.

WARNING !

A pressure switch must be incorporated whenever 110998 series pilot valve is employed as part of the control system.

The compressor will operate in the continuous run mode if the knurled knob is turned counterclockwise until it stops.

Installation

The pilot valve is mounted directly into the air tank. Compressors in the field, not equipped with these controls, can be converted. Consult your local Quincy distributor for assistance with conversion procedures.

Service

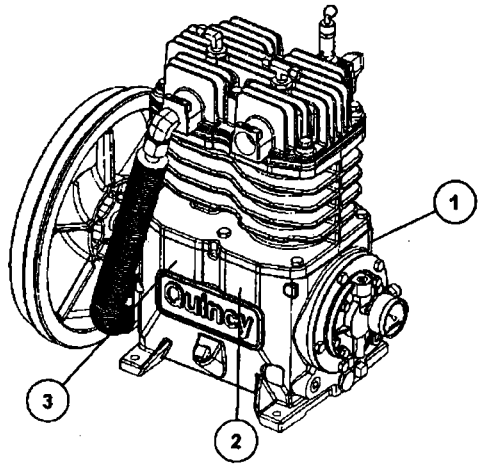
If a change in pilot valve operation is detected, remove the pilot valve from the air tank and check the screen in the inlet of the pilot valve for obstructions. Clean the screen if necessary.

Adjustment

The unloading pressure is adjustable and is regulated by turning the unload adjustment hex nut *(refer to pilot valve illustrations)*. Turn the hex nut clockwise to increase and counterclockwise to decrease the unloading pressure.

The differential (difference between unloading and loading pressure) is set by turning the differential adjustment hex nut *(refer to pilot valve illustrations)*. Increase the differential pressure by turning the hex nut clockwise - decrease by turning counterclockwise. Make all adjustments in small increments. Tighten the locknuts after adjustment.

DECALS



Decals			
Item #	Qty.	Part Number	Description
1	1	110831	serial number & nameplate
2	1	127889-A	decal, CAUTION!, MANUAL
3	1	127889-B	decal, DANGER!,"Air from this...."

Overhaul Kit KQT5FB
(for gas engine driven models)

Item #	Qty.	Part Number	Description
	1	111200	piston ring set
	1	111199	piston ring set
	1	114097-002	gasket set
	1	113946X	valve plate assembly
	1	110377E100	air filter element
	1	110190-013	piston pin
	1	110190-014	piston pin
	1	111333	crankcase breather
	1	113936-001	connecting rod assembly, LP
	1	113936-003	connecting rod assembly, HP
	2	111105-001	piston pin plug, .88 dia
	2	111105-002	piston pin plug, .62 dia

Overhaul Kit KQT5BB
(for models without head unloaders)

Item #	Qty.	Part Number	Description
	1	111200	piston ring set
	1	111199	piston ring set
	1	114097-002	gasket set
	1	113946X	valve plate assembly
	1	111146E100	air filter element
	1	110190-013	piston pin
	1	110190-014	piston pin
	1	111333	crankcase breather
	1	113936-001	connecting rod assembly, LP
	1	113936-003	connecting rod assembly, HP
	2	111105-001	piston pin plug, .88 dia
	2	111105-002	piston pin plug, .62 dia

Overhaul Kit KQT5DB
(for models with head unloaders)

Item #	Qty.	Part Number	Description
	1	111200	piston ring set
	1	111199	piston ring set
	1	114097-002	gasket set
	1	113946X	valve plate assembly
	1	110377E075	air filter element
	1	110190-013	piston pin
	1	110190-014	piston pin
	1	111333	crankcase breather
	1	113936-001	connecting rod assembly, LP
	1	113936-003	connecting rod assembly, HP
	2	111105-001	piston pin plug, .88 dia
	2	111105-002	piston pin plug, .62 dia

Head Kit KQT5AB
(for models without head unloaders)

Item #	Qty.	Part Number	Description
	1	114096-002	replacement valve assembly
	1	111146E100	air filter element

Head Kit KQT5CB
(for models with head unloaders)

Item #	Qty.	Part Number	Description
	1	114096-002	replacement valve assembly
	1	110377E075	air filter element

Head Kit KQT5EB
(for gas engine driven models)

Item #	Qty.	Part Number	Description
	1	114096-002	replacement valve assembly
	1	110377E100	air filter element

Gasket Set 114097-002

Item #	Qty.	Part Number	Description
	1	113618-002	gasket, valve plate to head
	1	113617	gasket, cylinder to valve plate
	1	113943	gasket, crankcase to cylinder
	1	113755	gasket, bearing carrier
	1	111106-001	oil seal
	6	114440-L23	hex. screw, 3/8-16 unc x 3.50
	6	110428N038	flatwasher, 3/8
	1	50278-101	head bolt torque instructions

Recommended Spare Parts

Item #	Qty.	Part Number	Description
	1	110377E100	air filter element, (fits 110377S100 and 110377S101 air filters; optional)
	or		
	1	111146E100	air filter element, (fits 111146F100 filter; for plain heads)
	or		
	1	110377E075	air filter element, (fits 111549 filter, standard)
	1	114097-002	gasket set
	1	114096-002	replacement valve assembly

TYPICAL UNIT REPAIR PARTS LIST

The parts listed here are for standard QT-5 (up to 175 PSI) units and may or may not be applicable to custom built units. Check with your local authorized Quincy distributor for parts that can be used for custom built units. Make sure the components you order are rated within the safe operating limits of your system. If you are doubtful about which components to order, contact you local Quincy distributor.

(QT-5 simplex - horizontal tank - electric motor)

Qty	Part Number	Part Number	Part Number	Description
	60 gal.	**80 gal.**		
1	113891-200	113268-200		tank (200 PSI maximum operating pressure)
1	2713	2713		tank drain valve
1	111136-075	111136-075		service valve
1	110514-200	110514-300		pressure gauge
1	110512-005	110512-005		pressure switch
1	110513-200	110513-200		pressure relief valve (in tank; 200 PSI)
1	111089-215	111089-215		pressure relief valve (in discharge line; 215 PSI)
1	111491	111491		check valve
4 ft.	110515-075	110515-075		discharge tube
2	110948-075	110948-075		tube fitting (nut with sleeve)
1	*110945-015*	*110945-015*		belt guard assembly
	3 h.p.	**5 h.p.**		
1	*110357B057*	*110258B060*		drive belt
1	*3844-118*	*3852-118*		motor pulley
	115/230v, 1Ø	**200v, 3Ø**	**230/460v, 3Ø**	
1	*4003*	*8098*	*124517-006*	3 h.p. motor (ODP)
1	**127466I005*	*8099*	*124517-005*	5 h.p. motor (ODP)

* 230 volt only

(QT-5 duplex - horizontal tank - electric motor)

Qty	Part Number	Part Number	Part Number	Description
	80 gal.	**120 gal.**		
1	113471-200	113467-200		tank (200 PSI maximum operating pressure)
2	N/A	*113281*		top plate
1	2713	111136-050		tank drain valve
1	111136-075	111136-100		service valve
1	110514-300	110514-300		pressure gauge
2	110512-005	110512-005		pressure switch, 135-175 PSI
1	110513-200	110513-200		pressure relief valve (in tank; 200 PSI)
2	111089-215	111089-215		pressure relief valve (in discharge line; 215 PSI)
2	111491	111491		check valve
8 ft.	110515-075	110515-075		discharge tube
2	110948-075	110948-075		tube fitting (nut with sleeve)
2	*110945-015*	*110945-015*		belt guard assembly
	3 h.p.	**5 h.p.**		
2	*110357B057*	*110258B060*		drive belt
2	*3844-118*	*3852-118*		motor pulley
	115/230v, 1Ø	**200v, 3Ø**	**230/460v, 3Ø**	
2	*4003*	*8098*	*124517-006*	3 h.p. motor (ODP)
2	**127466I005*	*8099*	*124517-005*	5 h.p. motor (ODP)

* 230 volt only

Part numbers shown in italics apply to tank mounted units and base mounted units.

TYPICAL UNIT REPAIR PARTS LIST

The parts listed here are for standard QT-5 (up to 175 PSI) units and may or may not be applicable to custom built units. Check with your local authorized Quincy distributor for parts that can be used for custom built units. Make sure the components you order are rated within the safe operating limits of your system. If you are doubtful about which components to order, contact you local Quincy distributor.

(QT-5 vertical tank - electric motor)

Qty	Part Number	Part Number	Part Number	Description
	60 gal.	**80 gal.**		
1	113267-200	113270-200		tank (200 PSI max. working pressure)
1	110425-025	110425-050		tank drain valve
1	111136-075	111136-075		ball valve
1	110514-300	110514-300		pressure gauge
1	110512-005	110512-005		pressure switch (135-175 PSI)
1	110513-200	110513-200		pressure relief valve (in tank; 200 PSI)
4 ft.	110515-075	110515-075		! discharge tube (3/4" copper tube to be formed by customer)
2	110948-075	110948-075		tube fitting (nut with sleeve)
1	111491	111491		check valve
1	111089-215	111089-215		relief valve (in discharge line; 215 PSI)
1	110945-015	110945-015		belt guard assembly
	3 h.p.	**5 h.p.**		
1	110357B057	110258B060		drive belt
1	3844-118	3852-118		motor pulley
	115/230v, 1Ø	**200v, 3Ø**	**230/460v, 3Ø**	
1	**4003*	*8098*	*124517-006*	3 h.p. motor (ODP)
1	**127466I005*	*8099*	*124517-005*	5 h.p. motor (ODP)

! Pre-formed discharge tubes are available. Contact factory with model & tank size information.

* 230 volt only.

(QT-5 gasoline engine driven - Kohler)

Qty	Part Number	Part Number	Part Number	Description
	base unit	**tank unit**		
1		113727-200		30 gallon tank (200 PSI maximum operating pressure)
1	113764			base plate
1		111136-025		tank drain valve
1		111136-050		ball valve
1		110514-300		pressure gauge
1		110513-200		pressure relief valve (in tank; 200 PSI)
1	110357B070	110357B070		drive belt
1	111221	111221		engine pulley
1	110623	110623		engine pulley bushing
1	113702K003	113702K003		belt guard assembly
1	113143-002	113143-002		throttle control (cable bullwhip)
1	113698	113698		Kohler engine group, 11 h.p. (includes exhaust system & throttle control)
3 ft.		110515-075		! discharge tube (3/4" copper tube to be formed by customer)
2		110948-075		tube fitting (nut with sleeve)
1	111089-215	111089-215		relief valve (in discharge line; 215 PSI)
1		110921-177		check valve (for head unload style)
1		113708-175		pilot, 165-175 PSI (for head unload style)
1	114551-175	114551-175		discharge unloader valve (for discharge line unload style)

! Pre-formed discharge tubes are available. Contact factory with model & tank size information.

TYPICAL UNIT REPAIR PARTS LIST

The parts listed here are for standard QT-5 (up to 175 PSI) units and may or may not be applicable to custom built units. Check with your local authorized Quincy distributor for parts that can be used for custom built units. Make sure the components you order are rated within the safe operating limits of your system. If you are doubtful about which components to order, contact you local Quincy distributor.

(QT-5 gasoline engine driven - Honda)

Qty	Part Number	Part Number	Part Number	Description
	base unit	**tank unit**		
1		113727-200		30 gallon tank (200 PSI maximum operating pressure)
1	113764			base plate
1		111136-025		tank drain valve
1		111136-050		ball valve
1		110514-300		pressure gauge
1		110513-200		pressure relief valve (in tank; 200 PSI)
1	110357B070	110357B070		drive belt
1	111221	111221		engine pulley
1	110623	110623		engine pulley bushing
1	113702K011	113702K011		belt guard assembly
1	113143-002	113143-002		throttle control (cable bullwhip)
1	113700-1	113700-1		Honda engine group, 11 h.p. (includes throttle control)
3 ft.		110515-075	!	discharge tube (3/4" copper tube to be formed by customer)
2		110948-075		tube fitting (nut with sleeve)
1	111089-215	111089-215		relief valve (in discharge line; 215 PSI)
1	114867-175	114867-175		discharge unloader valve

! Pre-formed discharge tubes are available. Contact factory with model & tank size information.

(QT-5 diesel engine driven - Yanmar)

Qty	Part Number	Part Number	Part Number	Description
	base unit	**tank unit**		
1		113727-200		30 gallon tank (200 PSI maximum operating pressure)
1	113764			base plate
1		111136-025		tank drain valve
1		111136-050		ball valve
1		110514-300		pressure gauge
1		110513-200		pressure relief valve (in tank; 200 PSI)
1	110258B070	110258B070		drive belt
1	111221	111221		engine pulley
1	110623	110623		engine pulley bushing
1	113702K006	113702K006		belt guard assembly
1	113143-001	113143-001		throttle control (cable bullwhip)
1	114080-001	114080		Yanmar engine group, 10 h.p. (includes throttle control)
2.5 ft.		110515-075	!	discharge tube (3/4" copper tube to be formed by customer)
2		110948-075		tube fitting (nut with sleeve)
1	111089-215	111089-215		pressure relief valve (in discharge line; 215 PSI)
1	110921-177	110921-177		check valve
1	113708-175	113708-175		pilot, 165-175 PSI

! Pre-formed discharge tubes are available. Contact factory with model & tank size information.

QUINCY COMPRESSOR AND ORTMAN FLUID POWER DIVISIONS

STANDARD TERMS AND CONDITIONS

LEGAL EFFECT: Except as expressly otherwise agreed to in writing by an authorized representative of Seller, the following terms and conditions shall apply to and form a part of this order and any additional and/or different terms of Buyer's purchase order or other form of acceptance are rejected in advance and shall not become a part of this order.

The rights of Buyer hereunder shall be neither assignable nor transferable except with the written consent of Seller.

This order may not be canceled or altered except with the written consent of Seller and upon terms which will indemnify Seller against all loss occasioned thereby. All additional costs incurred by Seller due to changes in design or specifications, modification of this order or revision of product must be paid for by Buyer.

In addition to the rights and remedies conferred upon Seller by this order, Seller shall have all rights and remedies conferred at law and in equity and shall not be required to proceed with the performance of this order if Buyer is in default in the performance of such order or of any other contract or order with seller.

TERMS OF PAYMENT: Unless otherwise specified in the order acknowledgment, the terms of payment shall be net cash within thirty (30) days after shipment. These terms shall apply to partial as well as complete shipments. If any proceeding be initiated by or against Buyer under any bankruptcy or insolvency law, or in the judgment of Seller the financial condition of Buyer, at the time the equipment is ready for shipment, does not justify the terms of payment specified, Seller reserves the right to require full payment in cash prior to making shipment. If such payment is not received within fifteen (15) days after notification of readiness for shipment, Seller may cancel the order as to any unshipped item and require payment of its reasonable cancellation charges.

If Buyer delays shipment, payments based on date of shipment shall become due as of the date when ready for shipment. If Buyer delays completion of manufacture, Seller may elect to require payment according to percentage of completion. Equipment held for Buyer shall be at Buyer's risk and storage charges may be applied at the discretion of Seller.

Accounts past due shall bare interest at the highest rate lawful to contract for but if there is no limit set by law, such interest shall be eighteen percent (18%). Buyer shall pay all cost and expenses, including reasonable attorney's fees, incurred in collecting the same, and no claim, except claims within Seller's warranty of material or workmanship, as stated below, will be recognized unless delivered in writing to Seller within thirty (30) days after date of shipment.

TAXES: All prices exclude present and future sales, use, occupation, license, excise, and other taxes in respect of manufacture, sales or delivery, all of which shall be paid by Buyer unless included in the purchase price at the proper rate or a proper exemption certificate is furnished.

ACCEPTANCE: All offers to purchase, quotations and contracts of sales are subject to final acceptance by an authorized representative at Seller's plant.

DELIVERY: Except as otherwise specified in this quotation, delivery will be F. O. B. point of shipment. In the absence of exact shipping instruction, Seller will use its discretion regarding best means of insured shipment. No liability will be accepted by Seller for so doing. All transportation charges are at Buyer's expense. Time of delivery is an estimate only and is based upon the receipt of all information and necessary approvals. The shipping schedule shall not be construed to limit seller in making commitments for materials or in fabricating articles under this order in accordance with Seller's normal and reasonable production schedules.

Seller shall in no event be liable for delays caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Seller's control. No provision for liquidated damages for any cause shall apply under this order. Buyer shall accept delivery within thirty (30) days after receipt of notification of readiness for shipment. Claims for shortages will be deemed to have been waived if not made in writing within ten (10) days after the receipt of the material in respect of which any such shortage is claimed. Seller is not responsible for loss or damage in transit after having

received "In Good Order" receipt from the carrier. All claims for loss or damage in transit should be made to the carrier.

TITLE & LIEN RIGHTS: The equipment shall remain personal property, regardless of how affixed to any realty or structure. Until the price (including any notes given therefore) of the equipment has been fully paid in cash, Seller shall, in the event of Buyer's default, have the right to repossess such equipment.

PATENT INFRINGMENT: If properly notified and given an opportunity to do so with friendly assistance, Seller will defend Buyer and the ultimate user of the equipment from any actual or alleged infringement of any published United States patent by the equipment or any part thereof furnished pursuant hereto (other than parts of special design, construction, or manufacture specified by and originating with Buyer), and will pay all damages and costs awarded by competent court in any suit thus defended or of which it may have had notice and opportunity to defend as aforesaid.

STANDARD WARRANTY: Seller warrants that products of its own manufacture will be free from defects in workmanship and materials under normal use and service for the period specified in the product instruction manual. Warranty for service parts will be ninety (90) days from date of factory shipment. Electric Motors, gasoline and diesel engines, electrical apparatus and all other accessories, components and parts not manufactured by Seller are warranted only to the extent of the original manufacturer's warranty.

Notice of the alleged defect must be given to the Seller, in writing with all identifying details including serial number, type of equipment and date of purchase within thirty (30) days of the discovery of the same during the warranty period.

Seller's sole obligation on this warranty shall be, at its option, to repair or replace or refund the purchase price of any product or part thereof which proves to be defective. If requested by Seller, such product or part thereof must be promptly returned to seller, freight prepaid, for inspection.

Seller warrants repaired or replaced parts of its own manufacture against defects in materials and workmanship under normal use and service for ninety (90) days or for the remainder of the warranty on the product being repaired.

This warranty shall not apply and Seller shall not be responsible or liable for:

(a) Consequential, collateral or special losses or damages;

(b) Equipment conditions caused by fair wear and tear, abnormal conditions of use, accident, neglect or misuse of equipment, improper storage or damage resulting during shipping;

(c) Deviation from operating instructions, specifications or other special terms of sale;

(d) Labor charges, loss or damage resulting from improper operation, maintenance or repairs made by person(s) other than Seller or Seller's authorized service station.

In no event shall Seller be liable for any claims whether arising from breach of contract or warranty or claims of negligence or negligent manufacture in excess of the purchase price.

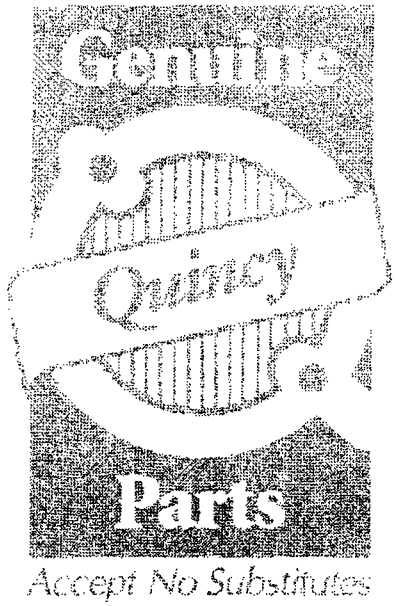
THIS WARRANTY IS THE SOLE WARRANTY OF SELLERS AND ANY OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE ARE HEREBY SPECIFICALLY EXCLUDED.

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, whether resulting from delays in delivery or performance, breach of warranty, negligent manufacture or otherwise.

ENVIROMENTAL AND OSHA REQUIREMENTS: At the time of shipment of the equipment from the factory, Quincy Compressor / Ortman Fluid Power will comply with the various Federal, State and local laws and regulations concerning occupational health and safety and pollution. However, in the installation and operation of the equipment and other matters over which the seller has no control, the Seller assumes no responsibility for compliance with those laws and regulations, whether by the way of indemnity, warranty or otherwise.

Quincy Service is always near. There are authorized Quincy Distributors located throughout the United States & Canada that stock genuine Quincy parts & accessories for a wide range of Quincy products.

Quincy Service specialists are factory trained and will help keep you in business. Call for Authorized Quincy Service.



Quincy Compressor®

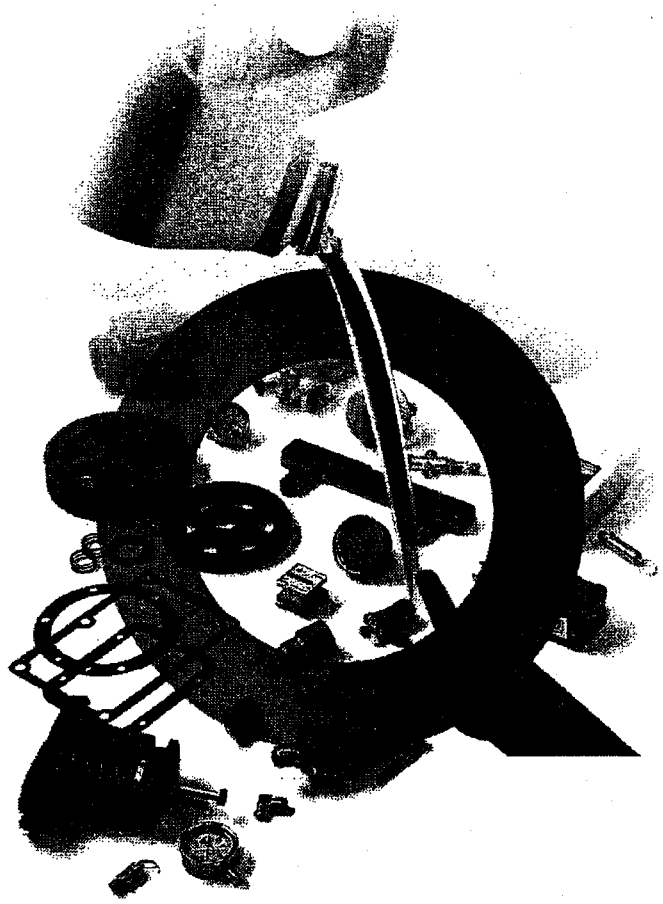
True Blue Reliability™

Reciprocating / Systems:	217.222.7700	**Rotary / Vacuum / Systems:**	334.937.5900
Air Master	217.277.0270	**Nearest Distributor:**	888.424.7729
E-mail:	trueblue.quincy@goodrich.com		
Discover:	www.quincycompressor.com		
	www.quincyairmaster.com		

QT® & PLT™ Industrial Series & Air Master® Series

Two Stage Compressors

Instruction Manual



This manual contains important safety information and should be made available to all personnel who operate and/or maintain this product. Carefully read this manual before attempting to operate or perform maintenance on this compressor.

Quincy Compressor®

True Blue Reliability℠

Manual No. 50161-104 **December 2001 Edition**

WARRANTY

Quincy Compressor Division
Industrial Reciprocating Products
QT & PLT Industrial / Air Master Two Stage Compressors

GENERAL PROVISIONS

Quincy Compressor (The Seller) warrants to each retail purchaser (Purchaser) products of the Seller's own manufacture against defects in material and workmanship. With respect to products not manufactured by the Seller, the Seller will, if practical, pass along the warranty of the original manufacturer.

The Seller's sole obligation under this warranty shall be, at its option, to repair, replace, or refund the purchase price of any product or part thereof which is deemed to be defective, provided the Purchaser meets all of the applicable requirements of this warranty and none of the limitations apply.

WARRANTY PERIODS

Basic Compressors

Seller warrants for twelve (12) months from date of start-up or twenty-four (24) months from factory shipment, whichever occurs first. This includes labor and approved travel. All warranty travel expense will be paid to the nearest authorized repair center.

Remanufactured Basics

Seller warrants for six (6) months from date of start-up or eighteen (18) months from date of factory shipment, whichever occurs first. This includes labor and approved travel. All warranty travel expense will be paid to the nearest authorized repair center.

Replacement Parts

Seller warrants repaired or replaced parts of its own manufacture against defects in material and workmanship under normal use and service for ninety (90) days, or for the remainder of the warranty on the product being repaired, whichever is longer.

Parts purchased outside the compressor's warranty period are warranted for ninety (90) days from the date of distributor sale, or one (1) year from the date of shipment from the factory, whichever occurs first.

Normal maintenance items and procedures are not warranted unless found to be defective in material or workmanship, i.e. but not limited to filters, gaskets, rings, valves and control lines.

Limitations

Notice of the alleged defect must be given to the Seller in writing with all identifying details, including serial number, model number, type of equipment and date of purchase within thirty (30) days of discovery of same during the warranty period. If requested by Seller, such product or product thereof must be promptly returned to Seller, freight collect for inspection.

The Seller must have the warranty registration card on file at Quincy, IL. within ten (10) days of start-up or the warranty may be declared null and void.

The above warranties shall not apply and Seller shall not be responsible nor liable for:

(a) Consequential, collateral or special losses or damages.
(b) Equipment conditions caused by fair wear and tear, abnormal conditions, accident, neglect or misuse of equipment, improper storage or damages resulting during shipment.
(c) Deviation from operating instructions, specifications or other terms of sales.
(d) Labor charges, loss or damage resulting from improper operation, maintenance or repairs made by person(s) other than Seller or Seller's authorized service station.
(e) Improper application or installation of product.
(f) Warranty travel expense is not covered on QT-5 & PLT-5 compressors sold as basics.

Disclaimer

In no event shall Seller be liable for any claims, whether arising from breach of contract or warranty or claims of negligence or negligent manufacture, in excess of the purchase price.

This warranty is the sole warranty of Seller and any other warranties, express, implied in law or implied in fact, including any warranties of merchantability and fitness for particular use, are hereby specifically excluded.

Contents

MAINTENANCE SCHEDULE CHECKLIST

Use this form to develop a routine maintenance schedule and record of performed maintenance. In the numbered columns enter the initials of the person who performed the maintenance and the date. Enter additional maintenance procedures in the spaces provided in the left hand column as needed per your application.

Equipment operating under humid or dirty conditions may require shorter intervals between scheduled maintenance.

The instruction manual provided with Quincy Compressor products, as well as any instructions supplied by manufacturers of supporting equipment, should be read and understood prior to performing maintenance.

NOTE: Make your entries on a copy of this form. Retain this original form to make more copies in the future.

Suggested Weekly (40 hrs.) Intervals

Maintenance Procedures	1	2	3	4	5	6	7	8	9	10	11	12
•manually test pressure relief valves												
•												
•clean surfaces of intercooler												
•												
•check distribution system for leaks												
•												
•check for contaminated lubricant *												
•												
•check for compressor/vacuum leaks												
•												
•												

Suggested Monthly (160 hrs.) Intervals

Maintenance Procedures	1	2	3
•check belt tension (if applicable)			
•			
•torque sheave fasteners (if applicable)			
•			
•change lubricant (& filter if applicable)*			
•			

*QRD Series excluded

SECTION 1 SAFETY

Safety First

At Quincy Compressor safety is not only a primary concern, but a faithfully performed practice. Beginning with the design stage, safety is built into "The World's Finest Compressor". It is the intention of this manual to pass along the "safety first" concept to you by providing safety precautions throughout its pages.

"DANGER !", "WARNING !", and **"CAUTION !"** are displayed in large bold capital letters in the left hand column to call attention to areas of vital concern. They represent different degrees of hazard seriousness, as stated below. The safety precaution is spelled out in bold upper and lower case letters in the right hand column.

DANGER ! **Immediate hazards which will result in severe personal injury or death.**

WARNING ! **Hazards or unsafe practices that could result in personal injury or death.**

CAUTION ! **Hazards or unsafe practices which could result in minor personal injury, product or property damage.**

Each section of this instruction manual, as well as any instructions supplied by manufacturers of supporting equipment, should be read and understood prior to starting the compressor. If there are any questions regarding any part of the instructions, please call your local Quincy Distributor, or the Quincy Compressor factory before creating a potentially hazardous situation. Life, limb, or equipment could be saved with a simple phone call.

Compressors are precision high speed mechanical equipment requiring caution in operation to minimize hazard to property and personnel. There are many obvious safety rules that must be observed in the operation of this type of equipment. Listed below are some additional safety precautions that must be observed.

- Transfer of toxic, dangerous, flammable or explosive substances using Quincy Compressor products is at the user's risk.

- Turn off and lockout/tagout (per OSHA regulation 1910.147) the main power disconnect switch before attempting to work or perform any maintenance.

- Do not attempt to service any part of the unit while it is operating.

- Per OSHA regulation 1910.147, relieve the system of all pressure before attempting to service any part of the unit.

- Do not operate the unit with any of its safety guards, shields, or screens removed.

received "In Good Order" receipt from the carrier. All claims for loss or damage in transit should be made to the carrier.

TITLE & LIEN RIGHTS: The equipment shall remain personal property, regardless of how affixed to any realty or structure. Until the price (including any notes given therefore) of the equipment has been fully paid in cash, Seller shall, in the event of Buyer's default, have the right to repossess such equipment.

PATENT INFRINGMENT: If properly notified and given an opportunity to do so with friendly assistance, Seller will defend Buyer and the ultimate user of the equipment from any actual or alleged infringement of any published United States patent by the equipment or any part thereof furnished pursuant hereto (other than parts of special design, construction, or manufacture specified by and originating with Buyer), and will pay all damages and costs awarded by competent court in any suit thus defended or of which it may have had notice and opportunity to defend as aforesaid.

STANDARD WARRANTY: Seller warrants that products of its own manufacture will be free from defects in workmanship and materials under normal use and service for the period specified in the product instruction manual. Warranty for service parts will be ninety (90) days from date of factory shipment. Electric Motors, gasoline and diesel engines, electrical apparatus and all other accessories, components and parts not manufactured by Seller are warranted only to the extent of the original manufacturer's warranty.

Notice of the alleged defect must be given to the Seller, in writing with all identifying details including serial number, type of equipment and date of purchase within thirty (30) days of the discovery of the same during the warranty period.

Seller's sole obligation on this warranty shall be, at its option, to repair or replace or refund the purchase price of any product or part thereof which proves to be defective. If requested by Seller, such product or part thereof must be promptly returned to seller, freight prepaid, for inspection.

Seller warrants repaired or replaced parts of its own manufacture against defects in materials and workmanship under normal use and service for ninety (90) days or for the remainder of the warranty on the product being repaired.

This warranty shall not apply and Seller shall not be responsible or liable for:

(a) Consequential, collateral or special losses or damages;

(b) Equipment conditions caused by fair wear and tear, abnormal conditions of use, accident, neglect or misuse of equipment, improper storage or damage resulting during shipping;

(c) Deviation from operating instructions, specifications or other special terms of sale;

(d) Labor charges, loss or damage resulting from improper operation, maintenance or repairs made by person(s) other than Seller or Seller's authorized service station.

In no event shall Seller be liable for any claims whether arising from breach of contract or warranty or claims of negligence or negligent manufacture in excess of the purchase price.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLERS AND ANY OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE ARE HEREBY SPECIFICALLY EXCLUDED.

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, whether resulting from delays in delivery or performance, breach of warranty, negligent manufacture or otherwise.

ENVIROMENTAL AND OSHA REQUIREMENTS: At the time of shipment of the equipment from the factory, Quincy Compressor / Ortman Fluid Power will comply with the various Federal, State and local laws and regulations concerning occupational health and safety and pollution. However, in the installation and operation of the equipment and other matters over which the seller has no control, the Seller assumes no responsibility for compliance with those laws and regulations, whether by the way of indemnity, warranty or otherwise.

•Do not remove or paint over any DANGER!, WARNING!, CAUTION!, or instructional materials attached to the compressor. Lack of information regarding hazardous conditions can cause property damage or personal injury.

•Periodically check all pressure relief valves for proper operation.

•Do not change the pressure setting of the pressure relief valve, restrict the function of the pressure relief valve, or replace the pressure relief valve with a plug.

•Do not install a shutoff valve in the compressor discharge line without first installing a pressure relief valve of proper size and design between the shutoff valve and the compressor.

•Do not use plastic pipe, rubber hose, or lead-tin soldered joints in any part of the compressed air system.

•Alterations must not be made to this compressor without Quincy Compressor's approval.

•Be sure that all tools, shipping and installation debris have been removed from the compressor and installation site prior to starting the compressor.

•Do not operate the compressor in excess of the ASME pressure vessel rating for the receiver or the service rating of the compressor, whichever is lower.

•Make a general overall inspection of the unit daily and correct any unsafe situations.

•Reckless behaviour of any kind involving compressed air is dangerous and can cause very serious injury to the participants.

•Provisions should be made to have the instruction manual readily available to the operator and maintenance personnel. If for any reason any part of the manual becomes illegible or the manual is lost, have it replaced immediately. The instruction manual should be read periodically to refresh one's memory. It may prevent a serious or fatal accident.

•Never use a flammable or toxic solvent for cleaning the air filter or any parts.

DANGER !

Air used for breathing or food processing must meet OSHA 29 CFR 1910.134 or FDA 21 CFR 178.3570 regulations. Failure to do so may cause severe injury or death.

The owner, lessor or operator of any compressor unit manufactured by Quincy Compressor is hereby warned that failure to observe the above safety precautions may result in serious injury to personnel and/or damage to property.

Quincy Compressor neither states as fact, nor in any way implies that the above list of safety precautions is an all inclusive list, the observance of which will prevent all damage to property or injury to personnel.

QUINCY COMPRESSOR AND ORTMAN FLUID POWER DIVISIONS

STANDARD TERMS AND CONDITIONS

LEGAL EFFECT: Except as expressly otherwise agreed to in writing by an authorized representative of Seller, the following terms and conditions shall apply to and form a part of this order and any additional and/or different terms of Buyer's purchase order or other form of acceptance are rejected in advance and shall not become a part of this order.

The rights of Buyer hereunder shall be neither assignable nor transferable except with the written consent of Seller.

This order may not be canceled or altered except with the written consent of Seller and upon terms which will indemnify Seller against all loss occasioned thereby. All additional costs incurred by Seller due to changes in design or specifications, modification of this order or revision of product must be paid for by Buyer.

In addition to the rights and remedies conferred upon Seller by this order, Seller shall have all rights and remedies conferred at law and in equity and shall not be required to proceed with the performance of this order if Buyer is in default in the performance of such order or of any other contract or order with seller.

TERMS OF PAYMENT: Unless otherwise specified in the order acknowledgment, the terms of payment shall be net cash within thirty (30) days after shipment. These terms shall apply to partial as well as complete shipments. If any proceeding be initiated by or against Buyer under any bankruptcy or insolvency law, or in the judgment of Seller the financial condition of Buyer, at the time the equipment is ready for shipment, does not justify the terms of payment specified, Seller reserves the right to require full payment in cash prior to making shipment. If such payment is not received within fifteen (15) days after notification of readiness for shipment, Seller may cancel the order as to any unshipped item and require payment of its reasonable cancellation charges.

If Buyer delays shipment, payments based on date of shipment shall become due as of the date when ready for shipment. If Buyer delays completion of manufacture, Seller may elect to require payment according to percentage of completion. Equipment held for Buyer shall be at Buyer's risk and storage charges may be applied at the discretion of Seller.

Accounts past due shall bare interest at the highest rate lawful to contract for but if there is no limit set by law, such interest shall be eighteen percent (18%). Buyer shall pay all cost and expenses, including reasonable attorney's fees, incurred in collecting the same, and no claim, except claims within Seller's warranty of material or workmanship, as stated below, will be recognized unless delivered in writing to Seller within thirty (30) days after date of shipment.

TAXES: All prices exclude present and future sales, use, occupation, license, excise, and other taxes in respect of manufacture, sales or delivery, all of which shall be paid by Buyer unless included in the purchase price at the proper rate or a proper exemption certificate is furnished.

ACCEPTANCE: All offers to purchase, quotations and contracts of sales are subject to final acceptance by an authorized representative at Seller's plant.

DELIVERY: Except as otherwise specified in this quotation, delivery will be F. O. B. point of shipment. In the absence of exact shipping instruction, Seller will use its discretion regarding best means of insured shipment. No liability will be accepted by Seller for so doing. All transportation charges are at Buyer's expense. Time of delivery is an estimate only and is based upon the receipt of all information and necessary approvals. The shipping schedule shall not be construed to limit seller in making commitments for materials or in fabricating articles under this order in accordance with Seller's normal and reasonable production schedules.

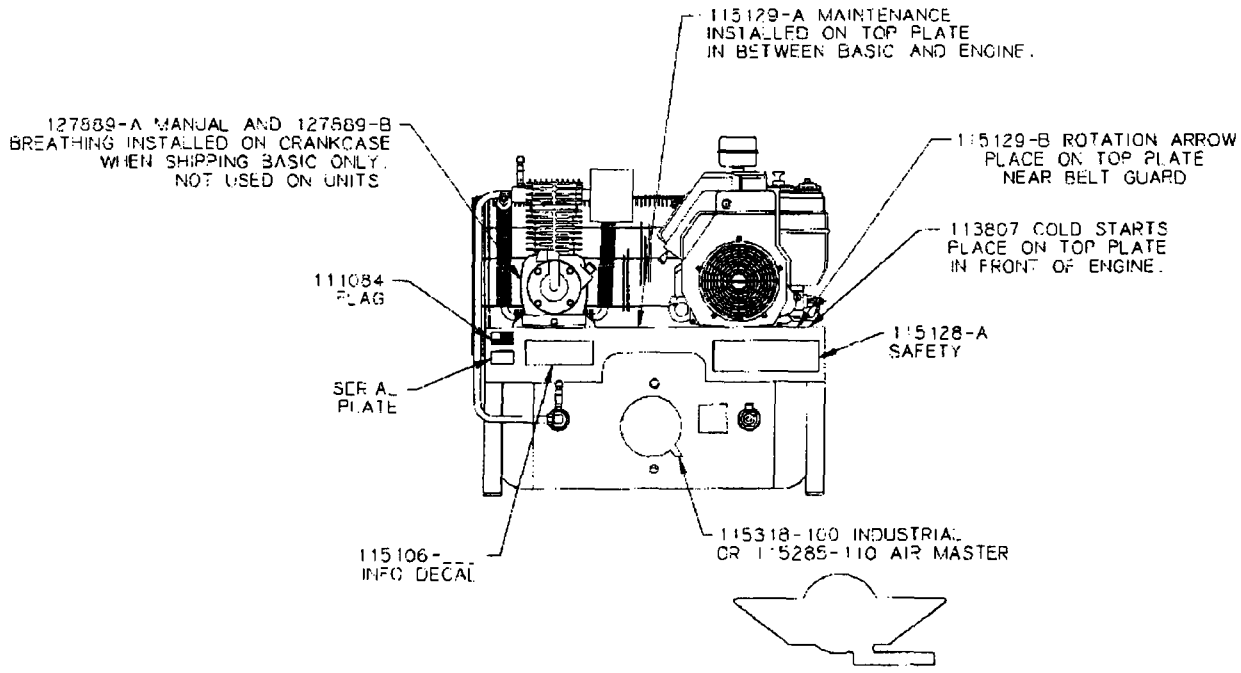
Seller shall in no event be liable for delays caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Seller's control. No provision for liquidated damages for any cause shall apply under this order. Buyer shall accept delivery within thirty (30) days after receipt of notification of readiness for shipment. Claims for shortages will be deemed to have been waived if not made in writing within ten (10) days after the receipt of the material in respect of which any such shortage is claimed. Seller is not responsible for loss or damage in transit after having

Every effort has been taken to ensure that complete and correct instructions have been included in this manual. However, possible product updates and changes may have occurred since this printing. Quincy Compressor reserves the right to change specifications without incurring any obligation for equipment previously or subsequently sold.

Summary of Changes to This Manual

(since previous printing dated March 2000):

· QT-54 information was added



Typical QT & PLT Series Engine Driven Unit with Horizontal Receiver

SECTION 2 SYSTEM DYNAMICS

Description & Application

Quincy Compressor QT Series and PLT Series compressors are heavy duty, air cooled, belt driven compressors. QT Series two stage compressors are splash lubricated and capable of delivering 175 PSIG of compressed air. The PLT Series compressors are pressure lubricated and capable of delivering 175 PSIG of compressed air.

Principles of Compression Cycles

Two Stage Compressors

During the downstroke of the piston of a two stage compressor, air is drawn through an intake valve in the head of the compressor into the low pressure cylinder and compressed during the upstroke of the piston.

The compressed air is then released through a discharge valve in the head of the compressor to an intercooler (usually finned tubing) where the heat resulting from compression is allowed to dissipate. The cooler compressed air is then drawn into a second compression cylinder, the high pressure cylinder, for compression to final pressure.

From there the compressed air is released through a discharge valve to an air receiver tank or directly to a network of compressed air supply lines. In one revolution of the crankshaft a compression cycle is completed.

Principles of Lubrication Systems

Splash Lubricated Compressors (QT Series)

With each stroke of the compressor, a dipper attached to the bottom of the connecting rod, dips into an oil bath at the bottom of the crankcase. This dipper splashes oil throughout the interior of the crankcase, lubricating all moving parts.

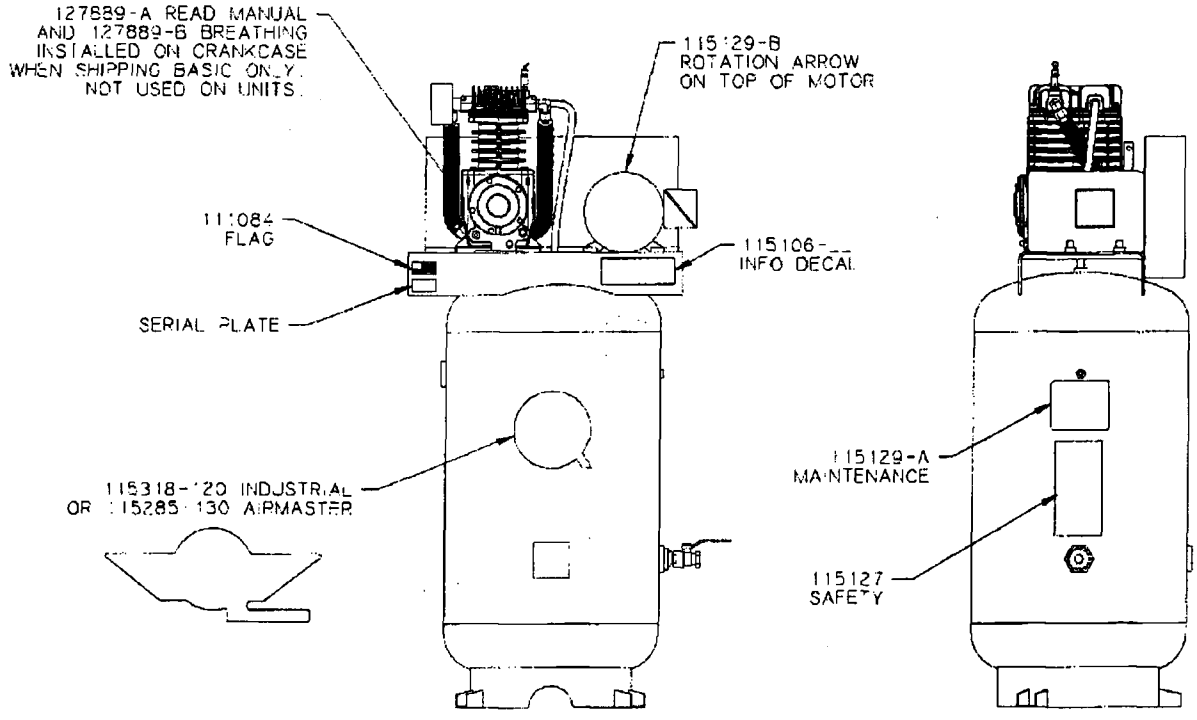
It is important with this system that the correct oil level be maintained. If the oil level is too high, excessive oil carryover could result. If the oil level is too low, or the compressor is not operated within the correct RPM range, the moving parts will not be adequately lubricated.

Pressure Lubricated Compressors (PLT Series)

Moving parts within the crankcase are supplied with lubrication by a positive displacement, gerotor type oil pump. Oil is drawn up from the bottom of the crankcase to the oil pump through an oil sump strainer screen. Oil travels under pressure through drilled journals in the crankshaft to lubricate crankshaft bearings and connecting journals.

Optional Low Oil Level Switch

QT-5, PLT-5, QT-7.5, PLT-7.5 & QT-10 compressors are available with an optional low oil level switch. A separate instruction manual is available which explains the operation, retrofit installation, and removal for inspection of the low oil level switch. Request instruction manual # 112210-101.



Typical QT & PLT Series Unit with Vertical Receiver

Principles of Cooling Systems

Fan blades of the compressor sheave force ambient air across fins of the cylinder head(s), and intercooler fins of two stage compressors, to cool the compressor. These compressors are designed to operate in a counterclockwise rotation. Due to standard drive motor limitations, it is recommended that the compressor be operated in temperatures under 104°F.

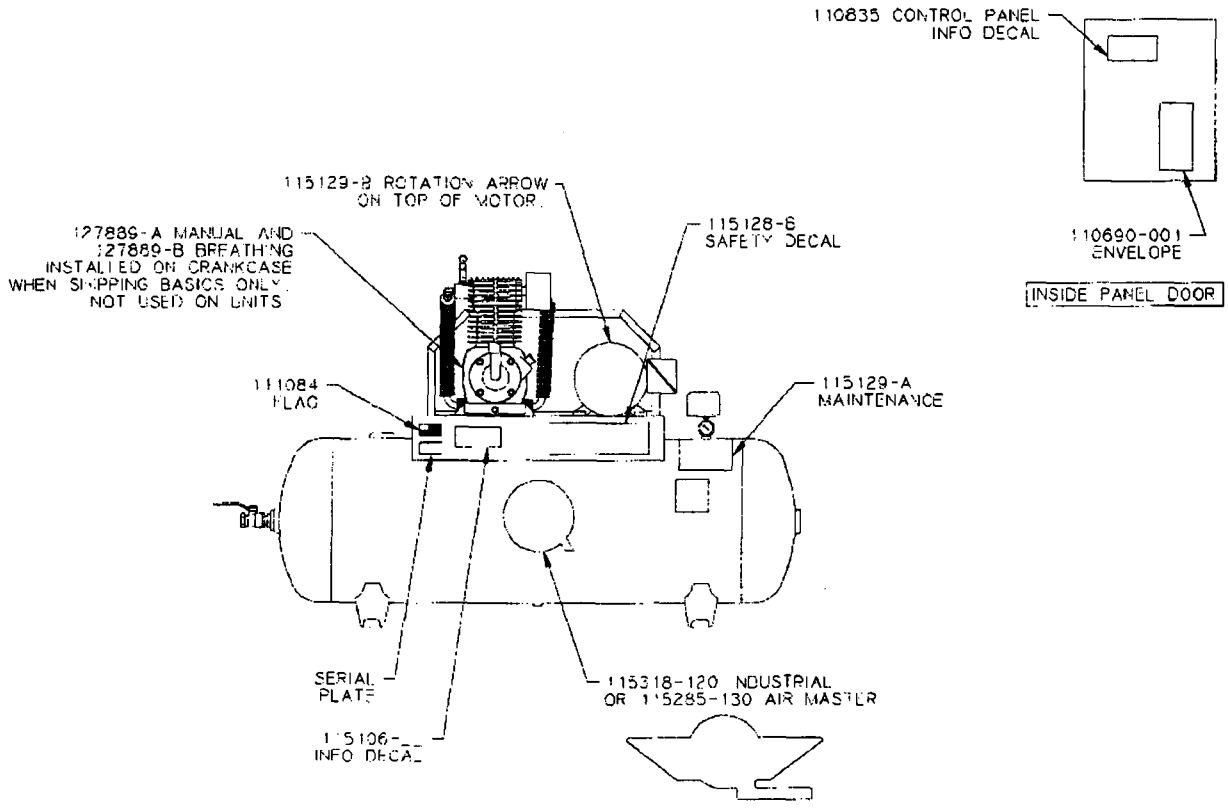
Principles of Dryers & Filters

Moisture occurs naturally in air lines as a result of compression. Moisture vapor in ambient air is concentrated when pressurized and condenses when cooled in downstream air piping. Compressed air dryers reduce the moisture vapor concentration and prevent water formation in compressed air lines. Dryers are a recommended companion to filters, aftercoolers, and automatic drains for improving the productivity of compressed air systems.

Water and moisture vapor removal increases the efficiency of air operated equipment, reduces contamination and rusting, increases the service life of pneumatic equipment and tools, prevents air line freeze-ups, and reduces product rejects.

SECTION 7 REFERENCE INFORMATION

Decal Locations



Typical QT & PLT Series Unit with Horizontal Receiver

Specifications

		QT-5/PLT-5	QT-7.5/PLT-7.5	QT-10
Cylinder Bore Dia.	**H.P.**	2.250/2.251	2.500/2.501	2.753/2.752
	L.P.	4.00/4.001	4.502/4.503	5.003/5.002
Piston Skirt Dia.	**H.P.**	2.247/2.246	2.497/2.496	2.749/2.748
	L.P.	3.995/3.994	4.499/4.498	4.997/4.995
Piston / Cylinder	**H.P.**	0.003/0.005	0.003/0.005	.003/.005
Clearance at Skirt	**L.P.**	0.005/0.007	0.003/0.005	.005/.008
Crankshaft Dia. journals		1.2500/1.2495	1.2500/1.2495	1.7500/1.7495
main bearing (pulley end)		1.1819/1.1812	1.3788/1.3781	1.5756/1.5749
main bearing (opposite pulley end)		1.1819/1.1812	1.1819/1.1812	1.3788/1.3781
Housing Bore (pulley end)		2.4409/2.4419	2.8346/2.8351	3.1506/3.1496
Main Bearing (opposite pulley end)		2.4409/2.4419	2.4409/2.4419	2.8349/2.8344
Crankshaft End Play		N/A	N/A	N/A
RPM Range	**electric**	400-1000 RPM	500-1060 RPM	400-1000 RPM
	gas	1060 RPM	1060 RPM	

		QT-15/PLT-15	QT-25	QT-54
Cylinder Bore Dia.	**H.P.**	2.500/2.501	3.250/3.251	2.000/2.001
	L.P.	4.502/4.503	6.000/6.001	2.750/2.751
Piston Skirt Dia.	**H.P.**	2.4985/2.4980	3.2480/3.2475	1.9955/1.9945
	L.P.	4.499/4.498	5.993/5.992	2.7455/2.7445
Piston / Cylinder	**H.P.**	0.0015/0.0030	0.002/0.0035	.0045/.0065
Clearance at Skirt	**L.P.**	.003/0.005	0.007/0.009	.0045/.0065
Crankshaft Dia. journals		1.7500/1.7495	2.2485/2.2480	1.1250/1.1245
main bearing (pulley end)		1.5753/1.5749	2.1275/2.1265	1.1816/1.1812
main bearing (opposite pulley end)		1.3785/1.3781	2.0025/2.0015	1.1816/1.1812
Housing Bore (pulley end)		3.5433/3.5442	4.375/4.376	2.442/2.441
Main Bearing (opposite pulley end)		2.8341/2.8346	3.6708/3.6713	2.442/2.441
Crankshaft End Play		N/A	.002/.0035	N/A
RPM Range		400-1150 RPM	600-940 RPM	550-1420 RPM

Trouble	Probable Cause
Excessive oil consumption	•Compressor runs unloaded too long •Worn piston rings •Restricted intake system •Compressor running too hot •Breather valve not functioning properly •Oil level in crankcase too high •Oil viscosity wrong for the application •Connecting rod out of alignment, bent or twisted •Leaking oil seal •Piston rings not seated *(allow 100 hours for seating)* •Wrong oil *(may be a detergent oil with a tendency to foam)* •Inferior grade of oil
Excessive current draw *(To determine maximum amperage allowed, multiply the FLA on the motor nameplate by the service factor.)* **CAUTION !** **Motor surface temperature normally exceeds 170° F.**	•Low voltage *(must be within 10% of nameplate voltage)* •Loose electrical connection •Wire size too small •Incorrect oil •Discharge pressure too high •Intercooler plugging •Bearings tight or seizing •No crankshaft endplay •Motor sized incorrectly •Motor defective •Drive belts too tight
Failure to start	•Power not on •Blown circuit fuse •Thermal overload fuses tripped •Low voltage •Faulty start switch •Power failure •Pressure switch incorrectly adjusted or faulty •Loose or broken wire •Motor defective •Compressor seized
Motor stalls	•Motor overloaded *(refer to* **Excessive current draw***)*

SECTION 3 INSTALLATION

Receiving Delivery

Immediately upon receipt of compressor equipment and prior to completely uncrating, the following steps should be taken:

Step 1) Inspect compressor equipment for damage that may have occurred during shipment. If any damage is found, demand an inspection from the carrier. Ask the carrier how to file a claim for shipping damages. (Refer to **SECTION 3, *Freight Damage*** for complete details.) **Shipping damage is not covered by Quincy Compressor warranty.**

Step 2) Insure that adequate lifting equipment is available for moving the compressor equipment.

WARNING ! **Improper lifting can result in component or system damage, or personal injury. Follow good shop practices and safety procedures when moving the unit.**

Step 3) Read the compressor nameplate to verify the model and size ordered.

Step 4) Read the motor nameplate to be sure the motor is compatible with your electrical conditions (volts, phase, hertz).

Step 5) Read the pressure relief valve nameplate to be sure it does not exceed the working pressure shown on the compressor or any other component in the system.

Step 6) **Read and understand the safety precautions contained within this manual.** The successful and efficient operation of compressor equipment depends largely upon the amount of care taken to install and maintain the equipment. Quincy Compressor strongly recommends that any or all person(s) in charge of installing, maintaining, or servicing one of our compressors read and understand the entire contents of this manual in order to perform such duties safely and efficiently.

Freight Damage

It is extremely important that you examine every carton and crate as soon as you receive it. If there is any obvious damage to the shipping container, have the delivering carrier sign the freight bill, noting the apparent damage, and request a damage report.

If concealed damage is discovered at a later date, the carrier must be notified within 15 days of initial receipt of freight. Concealed shipping damage is not covered by Quincy Compressor Warranty. Contact the carrier as soon as possible, giving them an opportunity to inspect the shipment at the premises where the delivery was made. Do not move the damaged freight from the premises where the original delivery was made.

Trouble	Probable Cause
Intercooler pressure abnormally low *(Two stage models only)*	•Compressor valves or head unloaders in first stage not functioning properly or defective •Restricted air inlet filter or suction line •Pilot valve or pressure switch set incorrectly or defective •Pressurized air at head unloader not venting properly when demand for air is required •Compressor valve or head gasket leaking •Worn piston rings •Defective pressure gauge •Leaking air at intercooler or intercooler connections
Compressor overheats	•Clogged intake system •Defective compressor valves •Pressure setting too high •Clogged intercooler, internally or externally •Inadequate ventilation, or recirculation of hot air •Pulley/sheave rotation wrong •Incorrect speed •Running clearances insufficient *(piston to cylinder wall or running gear)* •Lubrication inadequate •Compressor incorrectly sized
High discharge temperature	•Compressor valve assemblies defective •Discharge pressure too high •Inadequate ventilation or hot air recirculating •Cooling surfaces of compressor or intercooler excessively dirty •Internal surface of heat exchanger fouled •Ambient temperature too high •Scored or excessively worn cylinder walls
Compressor knocks	•Head clearance insufficient •Piston loose in cylinder bore, cylinder bore worn, piston or piston rings worn •Worn rods or main bearing •Wrong pressure setting, discharge pressure excessive •Crankcase lubrication inadequate •Loose pulley/sheave •Compressor valve assemblies loose

Retain all containers and packing for inspection by the carrier.

A claim form can be requested from the carrier: Standard Form for Presentation of Loss and Damage Claims (form # 3208). Your claim will need to be substantiated with the following documents:

a.) form #3208
b.) original bill of lading
c.) original paid freight bill
d.) original invoice or certified copy
e.) other particulars obtainable in proof of loss or damage (photos, damage inspection, etc.)

The proper description and classification of our product in the National Motor Freight Classification 100-H, contained in item 118100, reads as follows: Compressors, air, or air ends: with or without air tanks, hose or nozzles, mounted or not mounted."

We suggest that these instructions be circulated to your shipping and receiving personnel.

Location

QT & PLT Series air compressors should be installed in an area that is clean, well lighted, and adequately ventilated. Inspection and maintenance checks are required daily. Therefore, sufficient space needs to be provided around the compressor for safe and proper inspection, cleaning, and maintenance.

The compressor must not be installed closer than 24 inches to a wall or another compressor. This allows ample circulation of air across the compressor cylinders, heads and cooler (if so equipped). If at all possible, the pulley drive system (i.e. motor pulley, compressor sheave, belts and guard) should be located next to a wall to minimize any danger created by the drive system while the compressor is operating.

Due to standard drive motor limitations, it is recommended that the compressor be operated in temperatures under 104°F. In cold climates, the compressor should be installed in a heated building.

CAUTION ! **Do not operate this compressor in ambient temperatures lower than -15° F. A crankcase heater is recommended for a compressor that is to operate in temperatures under 32° F.**

WARNING ! **Under no circumstances should a compressor be used in an area that may be exposed to toxic, volatile, or corrosive atmosphere. Do not store toxic, volatile, or corrosive agents near the compressor.**

Noise

Noise is a potential health hazard that must be considered. There are federal and local laws governing acceptable noise levels. Check with local officials for specifications.

Trouble	Probable Cause
Excessive drive belt wear	•Pulley/sheave out of alignment •Belt too loose or too tight •Belt slipping •Pulley/sheave wobbling •Pulley/sheave groove damaged or rough •Incorrect belts
Low oil pressure	•Oil sump strainer plugged •Excessive leakage at crankshaft seals •Low oil level •Oil pump incorrectly assembled to the bearing carrier ("o"ring not properly located between oil pump body & bearing carrier) •Oil pressure adjusting screw not set properly •Defective oil pressure gauge
Compressor loads and unloads excessively	•Air receiver too small •Compressor valves or unloaders defective •Excessive system leakage •Compressor operating at incorrect speed •Unloader pilot differential set too close •Pressure switch defective
Defective pressure switch	•Moisture &/or oil buildup on the pressure switch diaphragm •Ruptured diaphragm •Burned contact points •Plugged air passage from the receiver to the pressure switch •Loose electrical connection
Excessive air pressure in air receiver	•Air pressure gauge inaccurate •Leaks in unloader piping system •Defective compressor head unloader •Pilot valve or pressure switch set incorrectly or defective •Pressure switch wired incorrectly •Tube to compressor head unloader plugged
Excessive intercooler pressure ***(Two stage models only)***	•Intercooler restricted or plugged •Compressor valves in second stage broken or not functioning properly •Pilot valve or pressure switch set incorrectly or defective •Pressure gauge defective

Excessive noise can be effectively reduced through various methods. Total enclosures, intake silencers, baffle walls, relocating or isolating the compressor can reduce noise levels. Care must be taken when constructing total enclosures or baffle walls. If not properly constructed or positioned, they could contribute to unacceptable noise levels or overheating. Consult your local Quincy Compressor Distributor if assistance is required.

WARNING ! **Unusual noise or vibration indicates a problem. Do not operate the compressor until the source has been identified and corrected.**

Electrical Supply Requirements

The electrical installation of this unit should be performed by a qualified electrician with knowledge of the National Electrical Code (NEC), OSHA code and/or any local or state codes having precedence.

Before installation, the electrical supply should be checked for adequate wire size and transformer capacity. Verify that the electrical supply voltage matches the requirements of the motor. A suitable circuit breaker or fused disconnect switch should be provided. When a 3 phase motor is used to drive a compressor, any unreasonable voltage imbalance between the legs must be eliminated and any high or low voltage corrected to prevent excessive current draw. **Note: This unit must be grounded.**

The installation, electric motor, wiring, and all electrical controls must be in accordance with NFPA 70-1996 National Electric Code, National Electric Safety Code, state and local codes. Failure to abide by the national, state and local codes may result in physical harm and/or property damage.

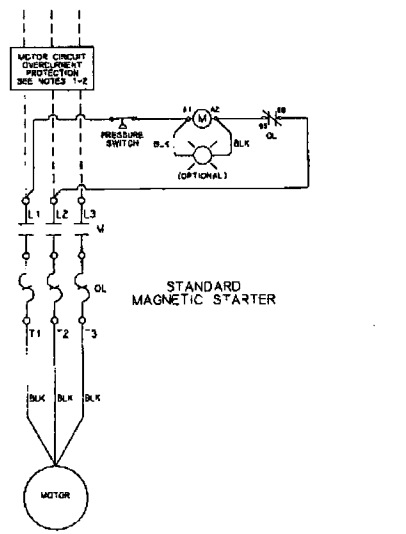
DANGER ! **High voltage may cause personal injury or death. Disconnect and lockout/tagout per OSHA regulation 1910.147 all electrical power supplies before opening the electrical enclosure or servicing.**

WARNING ! **Never assume a compressor is safe to work on just because it is not operating. It could restart at any time. Follow all safety precautions outlined in SECTION 5, *Stopping For Maintenance.***

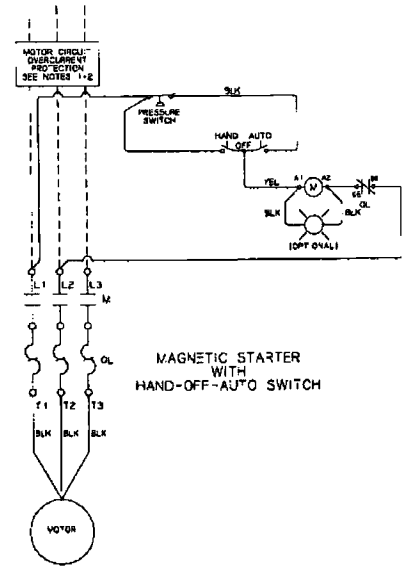
WARNING ! **Electrical enclosures and components must be in compliance with NEMA environmental ratings for the areas in which they are being installed.**

SECTION 6 TROUBLESHOOTING

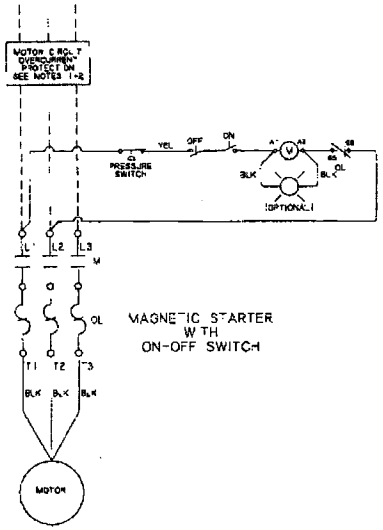
Trouble	Probable Cause
Low discharge pressure	•Restricted inlet •Defective compressor valves or valve unloading mechanism •Leaks in the compressed air distribution system at fittings, connections, etc. •Unloader pilot valve defective or set wrong •Pressure switch defective or set wrong •Drive belt slipping •Incorrect speed •Worn piston rings or loose piston •Leaking head gasket •Drain valve open •Defective pressure gauge •Excessive running clearances *(refer to* **SECTION 2,** ***Specifications)*** •Pressure relief valve leaking •Clogged intercooler •Loose compressor valves or leaking at valve gaskets •Compressor incorrectly sized for the altitude it is operating at •Piston rings not seated; allow 100 hours at full pressure
Water in the crankcase (lubricant appears milky)	•Compressor does not run long enough to get hot and vaporize the liquids squeezed out of the air during compression •Incorrect or inferior grade of lubricant •System pressure leaking back through discharge valve
Rusty valves and/or cylinders	•Compressor operated too infrequently •Compressor does not run long enough to get hot and vaporize the liquids squeezed out of the air during compression *(compressor may be too large for application)* •Compressor not properly prepared for storage •Discharge line from compressor head is pointed upward allowing con densation to drain back at shutdown
Excessive vibration	•Incorrect speed •Compressor valves not functioning properly •Loose pulley/sheave •Motor or engine out of balance •Compressor, motor or engine not secured tightly, or tightened into a bind •Foundation or frame inadequate •Piping inadequately supported or tightened into a bind •Excessive discharge pressure •Compressor feet may need to be leveled with shims



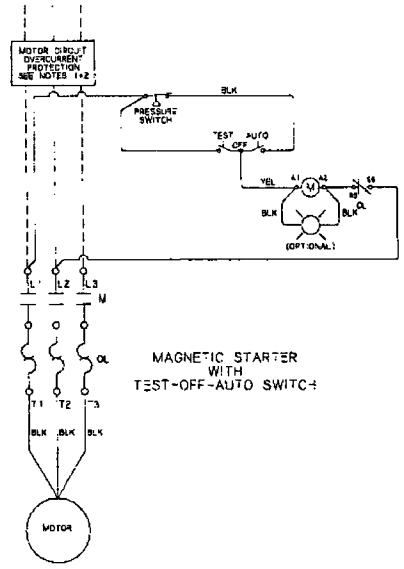
STANDARD
MAGNETIC STARTER



MAGNETIC STARTER
WITH
HAND-OFF-AUTO SWITCH



MAGNETIC STARTER
WITH
ON-OFF SWITCH



MAGNETIC STARTER
WITH
TEST-OFF-AUTO SWITCH

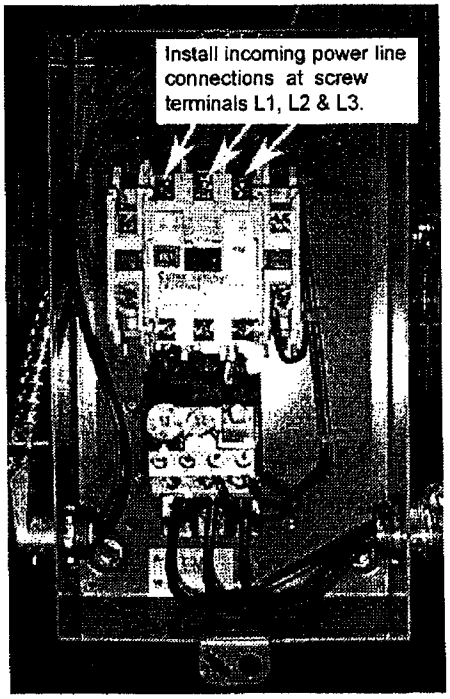


Fig. 3-1
3 Phase Start / Stop Control
Wiring Schematic WP1744A (Rev. D)

WARNING ! **Never exceed the designed pressure for the system or overload the motor beyond its Maximum Amp Draw.**

* Full Load Amps x Service Factor = Maximum Amp Draw

WARNING ! **Never assume a compressor is safe to work on just because it is not operating. It may be in the automatic stand-by mode and may restart any time. Follow all safety precautions outlined in SECTION 5, *Stopping For Maintenance.***

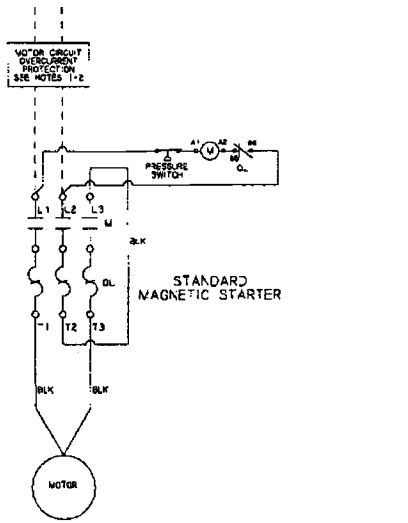
Torque Specifications
(in ft./lbs., dry threads)

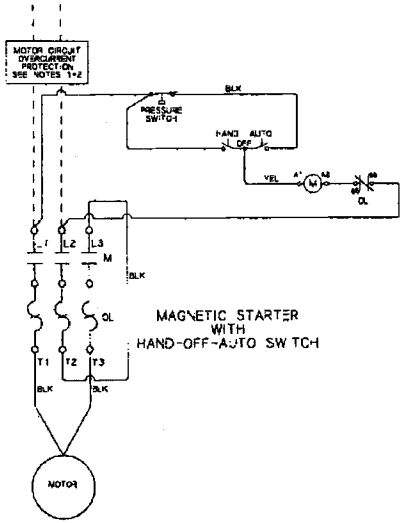
Basic Compressor Model	Rod Bolt	Brng. Carr.	Brng. Carr. Cover Plate	Adj. Plate	Hand Hole Plate	C'case to Cyl.	Cyl. to Head	Comp Pulley Bolts
QT-5 / PLT-5	20-22	30	17	N/A	N/A	30	†55	45
QT-7.5 / PLT-7.5	20-22	30	17	N/A	N/A	30	†55	45
QT-10	20-22	30	N/A	N/A	N/A	30	55	75
QT-15 / PLT-15	20-22	25	N/A	N/A	N/A	30	30	200
QT-25	40	75	N/A	75	30	75	80	150
QT-54	5-6	19	N/A	N/A	N/A	19	17	50

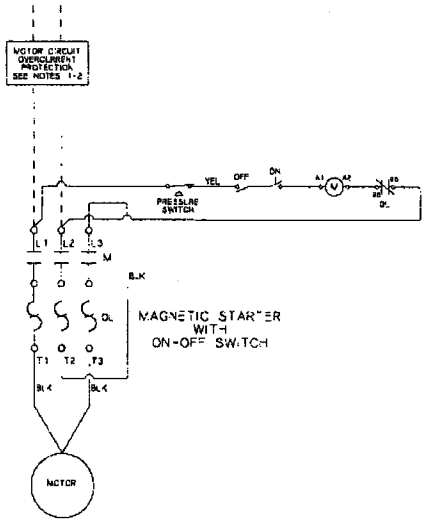
Torquing Cylinder to Head Capscrews

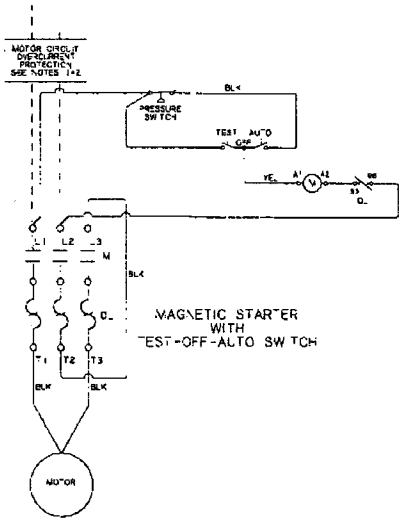
Torque cylinder to head capscrews to specifications listed in the parts book corresponding to the Record of Change for your compressor. Then, run the compressor for at least 1 hour. Shut the unit off and follow precautions outlined in **SECTION 5, *Stopping for Maintenance.*** Retorque the head capscrews to same specifications after the unit has cooled.

** Full load amps (FLA) & Service Factor can usually be found on the motor nameplate.*
† Reference torque spec. note in parts book corresponding to Record of Change for your compressor.









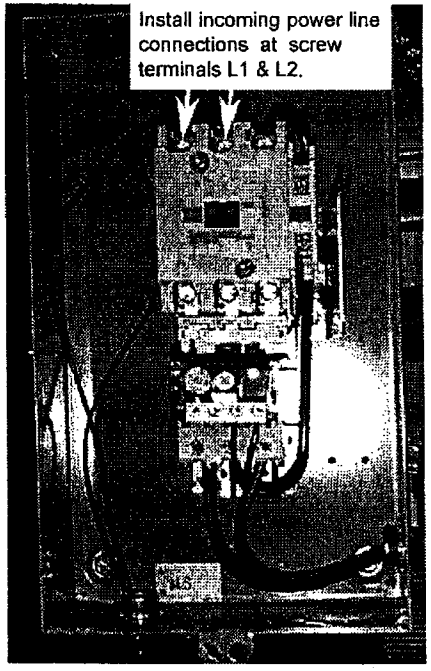


Fig. 3-2
Single Phase Start / Stop Control
Wiring Schematic WP1744B (Rev. D)

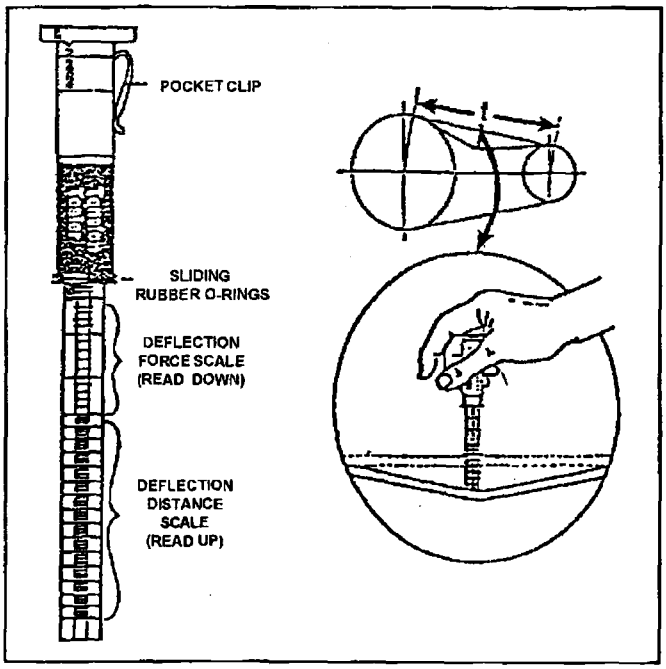


Fig. 5-2 Belt Tension Gauge Pix 1153

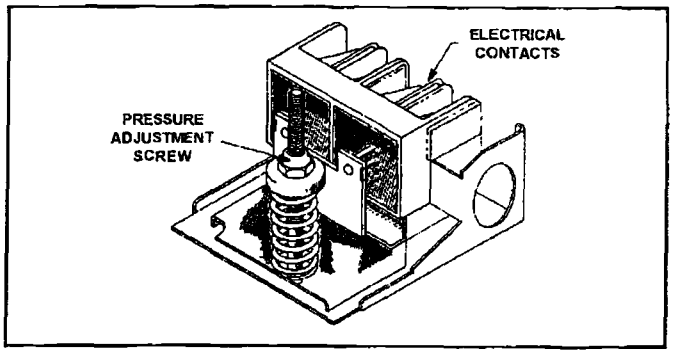


Fig. 5-3 Pressure Switch Pix 1067

Step 2) Determine the amount of deflection (in inches) required to measure deflection force (in pounds) by multiplying the span length x $^1/_{64}$(.016) (i.e. 32" span length x $^1/_{64}$ [.016] = $^1/_2$"[.50] of deflection required to measure deflection force).

Step 3) Lay a straightedge across the top outer surface of a drive belt from pulley to sheave.

Step 4) At the center of the span, perpendicular to the belt, apply pressure to the outer surface of the belt with a belt tension gauge (refer to **Fig. 5-2, Belt Tension Gauge**). Force the belt to the predetermined deflection (refer to **Step 2** above). Record the reading on the belt tension gauge and compare to the chart following **Fig 5-1**. The deflection force reading should be within the minimum and maximum values shown. Adjust belt(s) accordingly. New belts should be initially tensioned to the maximum value plus 33% (multiply by 1.33).

Step 5) Recheck the tension of the new belts several times in the first 50 hours of operation and adjust if necessary. Thereafter, check belt tension on a regular basis (refer to **SECTION 5, *Maintenance Schedule***).

Pressure Switch Adjustment

Pressure switches provided by Quincy Compressor are pre-set at the factory and usually do not require adjustment. However, the following procedures can be performed by a qualified electrician to adjust the pressure switch.

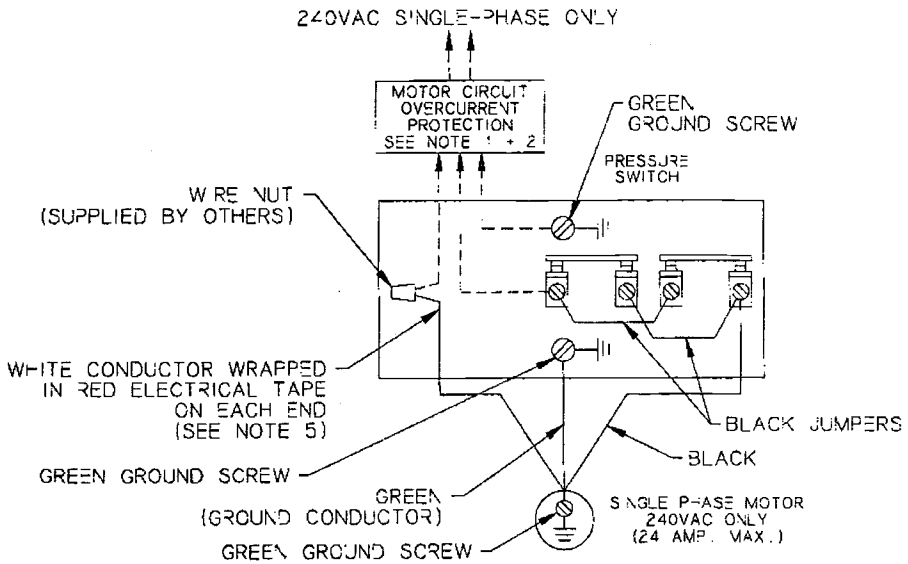
Step 1) Remove the pressure switch cover.

Step 2) While the compressor is running, screw the spring loaded adjustment screw in (clockwise) to increase the amount of air pressure required to open the switch and stop the unit. Screw the spring loaded adjustment screw out (counterclockwise) to decrease the amount of air pressure required to open the switch and stop the unit.

Standard pressure switches supplied by Quincy Compressor are equipped with a fixed 20 PSIG (approx.) differential. Optional switches include both pressure and differential adjustment capabilities.

WARNING !

Electric power always exists inside the pressure switch whenever the compressor package is connected to a power supply. Be careful not to touch any electrical leads when adjusting the pressure switch.



1) AT INSTALLATION, THE CUSTOMER IS TO PROVIDE DISCONNECT AND BRANCH CIRCUIT OVERCURRENT PROTECTION IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND/OR ANY LOCAL CODES HAVING PRECEDENCE.
2) GROUNDING: AT INSTALLATION, THE CUSTOMER IS TO PROVIDE GROUNDING BETWEEN THE POWER SUPPLY AND THE PRESSURE SWITCH IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND/OR ANY LOCAL CODES HAVING PRECEDENCE.
3) HIGH VOLTAGE IS PRESENT IN MOTOR WHEN PRESSURE SWITCH IS ACTUATED AND MOTOR IS NOT RUNNING. DISCONNECT AND LOCKOUT/TAGOUT PER O.S.H.A. REGULATION 1910.147 ALL ELECTRICAL POWER SUPPLIES BEFORE OPENING THE PRESSURE SWITCH OR MOTOR WHEN SERVICING, OR MAINTAINING THE COMPRESSOR.
4) DASHED LINES REPRESENT WIRES SUPPLIED BY OTHERS.
5) THE INSULATION OF THE WHITE WIRE IN THE 3-CONDUCTOR FLEXIBLE CORD IS TO BE ENTIRELY WRAPPED WITH RED ELECTRICAL TAPE ON EACH END.

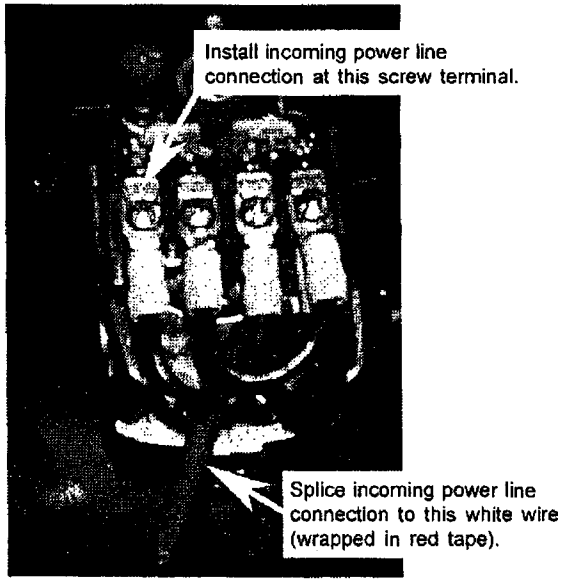


Fig. 3-3
Start / Stop Control- Pressure Switch / Motor
(for unit models 150934A712, 150935A712, 150959A712, 151047-712, 151048-712 & 151050-712)
Wiring Schematic WP1753 (Rev. H)

A new or rebuilt reciprocating compressor should be run for a total of 100 hours at full discharge operating pressure to break-in the new piston rings. Until the rings are seated, the compressor will discharge higher than normal amounts of oil. In light of this fact, the oil level should be checked more frequently during the 100 hour break-in period.

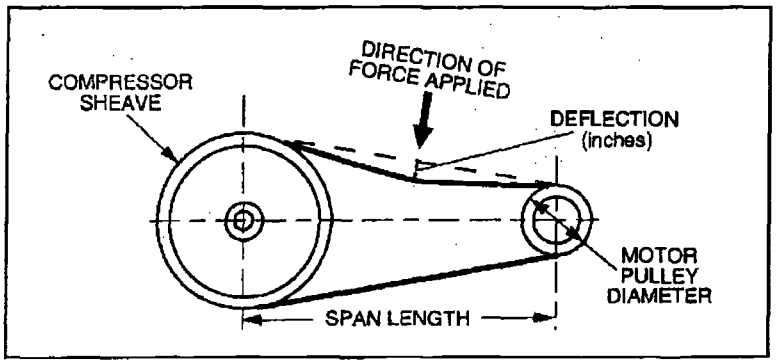
Pulley / Sheave Alignment & Belt Tension

Improper pulley/sheave alignment and belt tension are causes for motor overloading, excessive vibration, and premature belt and/or bearing failure. To prevent this from happening, check the pulley/sheave alignment and belt tension on a regular basis (refer to **SECTION 5, *Maintenance Schedule***).

Periodically inspect the motor pulley(s) and compressor sheave(s) for oil, grease, nicks or burrs. Clean or replace if necessary. Make sure they are securely fastened. Align the compressor sheave with the motor or engine pulley. Drive belt grooves of the pulley(s) and sheave(s) should be in line with each other. The compressor crankshaft must be parallel to the motor or engine drive shaft.

Belt tension should be measured and adjusted to provide smooth operation. Step-by-step procedures are provided here to correctly measure and set the drive belt tension:

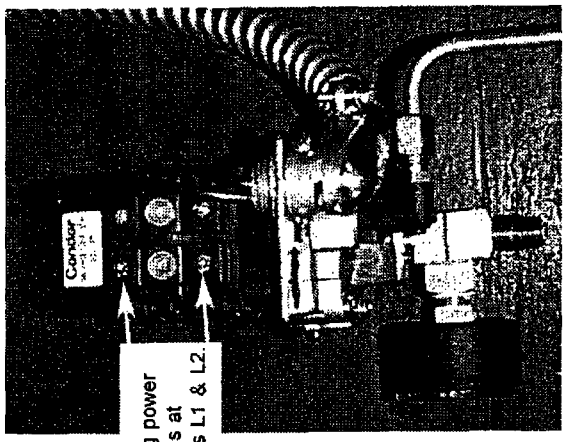
Step 1) Measure the span length of the drive. (Refer to **Fig. 5-1, Setting Belt Tension**.)



Pix 1152

Fig. 5-1
Setting Belt Tension

Belt Cross Section	Motor Pulley Dia. Range (inches)	Recommended Deflection Force (lbs.) Minimum	Maximum
A	QT-54 only	2	3
B	4.6	4.0	5.9
B	5.0 - 5.4	4.5	6.7
B	5.6 - 6.4	5.0	7.4
B	6.8 - 9.4	5.8	8.6



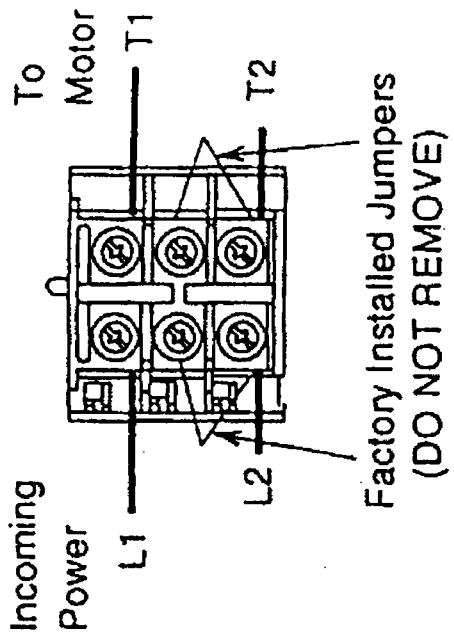


Fig. 3-4
Single Phase MDR Pressure Switch / Overload Relay Connection Diagram (Rated 22-30 Amps)

Lubrication

QT and PLT Series basic compressors and units are normally shipped from the factory *with* break-in lubricant in the crankcase. Before starting your compressor, check the lubricant level in the crankcase. The lubricant level of QT-5, PLT-5, QT-7.5, PLT-7.5, QT-10 & PLT-15 compressors must reach the bottom edge of the lubricant fill opening. The lubricant level of QT-15, QT-25 & QT-54 compressors must register between the high and low marks on the dipstick. **Replace the break-in lubricant after 100 hours of operation with Quin-*Cip* lubricant or consult the Quincy Compressor factory for recommendations!**

Quin-*Cip* lubricant has proven under extensive testing to minimize friction and wear, limit oil carryover, and reduce carbon and varnish deposits. It will support the performance characteristics and life designed into all Quincy compressors and is highly recommended. Refer to the charts below to determine the correct amount of lubricant and viscosity to use for your model and application.

Approximate Crankcase Lubricant Capacities

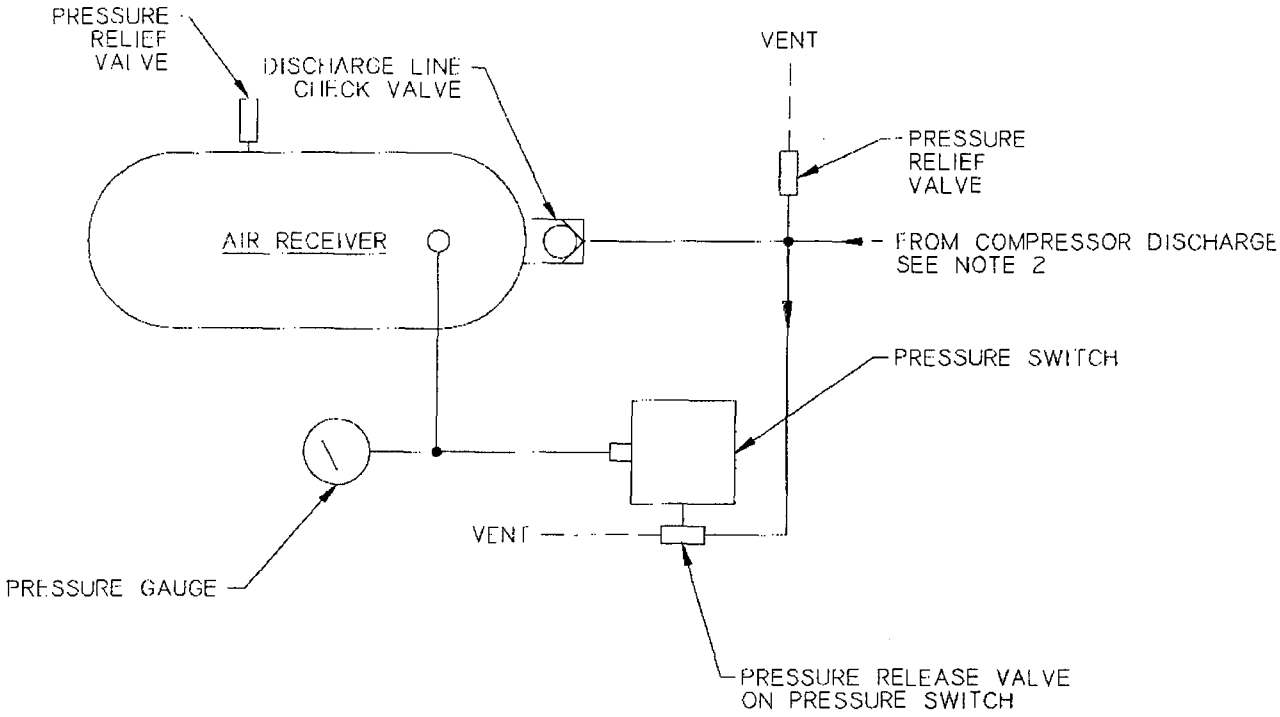
Basic Compressor Model	Lubricant Capacity
QT-5 & PLT-5	1 5/8 qts. (1.5 lit.)
QT-7.5 & PLT-7.5	1 5/8 qts. (1.5 lit.)
QT-10	1 7/8 qts. (1.8 lit.)
QT-15 & PLT-15	4 3/4 qts. (4.5 lit.)
QT-25	9 qts. (8.51 lit.)
QT-54	1 1/4 qts. (1.15 lit.)

Lubricant Specifications
(Use Quin-Cip lubricant or consult factory.)

Ambient Temperature	SAE Viscosity	ISO Viscosity
Below 0°F	SAE 5W	ISO 22
0-32° F	SAE 10W	ISO 32
32-80°F	SAE 20W	ISO 68
60-104°F	SAE 30	ISO 100

CAUTION ! **The lubricant selected must have a pour point at least 15° F lower than the minimum expected ambient temperature .**

CAUTION ! **Do not operate this compressor in ambient temperatures lower than -15° F. A crankcase heater is recommended for compressors operating in temperatures under 32° F.**



NOTE:

1) INSTALL PRESSURE RELIEF VALVE SO THAT MOISTURE CAN NOT ACCUMULATE IN VALVE INLET.
2) USE FLEXIBLE LINE BETWEEN REMOTE RECEIVER AND COMPRESSOR TO REDUCE STRAIN ON PIPING.

Fig. 3-4
Start / Stop Control
Piping Schematic WP1781B

contaminated, drain and replace.

- Drain receiver tank, drop legs and traps in air distribution system. Receiver tanks subjected to freezing temperatures may contain ice. Store the compressor unit in a heated area before attempting to drain moisture from the tank.
- Give compressor an overall visual inspection and be sure safety guards are in place.
- Check for any unusual noise or vibration.
- Check for oil leaks.
- Check all pressurized components for rust, cracks or leaks. Immediately discontinue use of the equipment and relieve all system pressure if any of these problems are discovered. Do not use the equipment until it has been inspected and repaired by a qualified mechanic.

Every 40 Hours (or Weekly)

- Manually operate the pressure relief valves to be certain they are working.
- Clean the cooling surfaces of the intercooler and compressor.
- Check the compressor for air leaks.
- Check the compressed air distribution system for leaks.
- Inspect oil for contamination & change if necessary.
- Clean or replace the air intake filter. Check more often under humid or dirty conditions.

Every 160 Hours (or Monthly)

- Check belt tension

Every 500 Hours (or Every 3 Months)

- Change oil (more frequently in harsher environments).
- Torque pulley clamp screws or jamnut.

Every 1000 Hours (or Every 6 Months)

- When Quin-*Cip* oil is used, oil change intervals may be extended to every 1000 hours or every 6 months, whichever occurs first (change more frequently in harsher conditions).
- Inspect compressor valves for leakage and/or carbon build-up. If excessive sludge build-up exists inside the crankcase, clean the inside of the crankcase as well as the screen. **Never use a flammable or toxic solvent for cleaning. Always use a safety solvent and follow the directions provided.**

Every 2000 Hours (or Every 12 Months)

- Inspect the pressure switch diaphragm and contacts. Inspect the contact points in the motor / starter.

Servicing Reed Valves

QT & PLT Series compressor valve plates and reed valves should be inspected and cleaned on a regular basis. The reed valves are made of stainless steel and can be cleaned with a stiff bristle brush*(not a wire brush!)*. A clean safety solvent may also be used to loosen carbon deposits on the valve plates and reed valves. Handle all parts with care; do not bend, mar or scratch any sealing surfaces.

DANGER ! **Never use gasoline, thinners, or other flammable solutions to clean valves or related parts.**

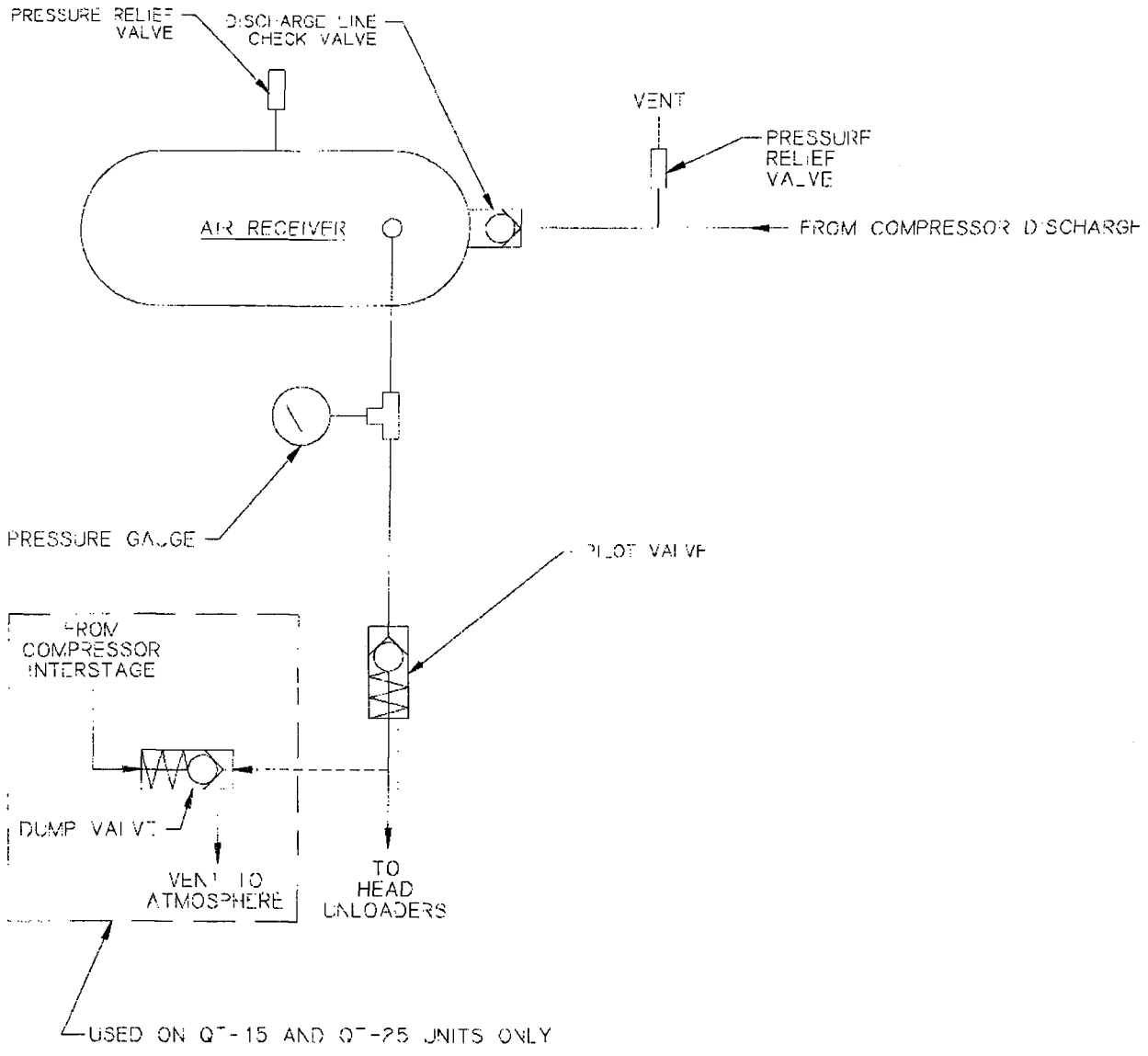


Fig. 3-5
Continuous Run - Load / Unload Control
Piping Schematic WP1781C

SECTION 5 MAINTENANCE & LUBRICATION

Stopping for Maintenance

The following procedures should be followed when stopping the compressor for maintenance or service:

Step 1) Per OSHA regulation 1910.147: The Control of Hazardous Energy Source (Lockout/Tagout), disconnect and lockout the main power source. Display a sign in clear view at the main power switch stating that the compressor is being serviced.

WARNING ! **Never assume a compressor is safe to work on just because it is not operating. It could restart at any time.**

Step 2) Isolate the compressor from the compressed air supply by closing a manual shutoff valve upstream and downstream from the compressor. Display a sign in clear view at the shutoff valve stating that the compressor is being serviced.

Step 3) Lock open a pressure relief valve within the pressurized system to allow the system to be completely de-pressurized. **NEVER** remove a plug to relieve the pressure!

Step 4) Open all manual drain valves within the area to be serviced.

Step 5) Wait for the unit to cool before starting to service. (Temperatures of 125°F can burn skin. Some surface temperatures exceed 350°F when the compressor is operating.)

Maintenance Schedule

To assure maximum performance and service life of your compressor, a routine maintenance schedule should be developed. A sample schedule has been included here to help you to develop a maintenance schedule designed for your particular application. Time frames may need to be shortened in harsher environments.

At the back of this instruction manual you will find a **Maintenance Schedule Checklist**. Make copies of this checklist and retain the master to make more copies as needed. On a copy of the checklist, enter dates and initials in the appropriate spaces. Keep the checklist and this Instruction Manual readily available near the compressor.

Maintenance Schedule Checklist Sample

Every 8 Hours (or Daily)

- QT-5, PLT-5, QT-7.5, PLT-7.5, QT-10 & PLT-15 oil levels should be kept at the top of the sight glass (add oil until it reaches the bottom edge of the oil fill opening).
- Maintain oil levels of QT-15, QT-25 & QT-54 models between high and low level marks on bayonet gauge. (Discoloration or a higher oil level reading may indicate the presence of condensed liquids.) If oil is

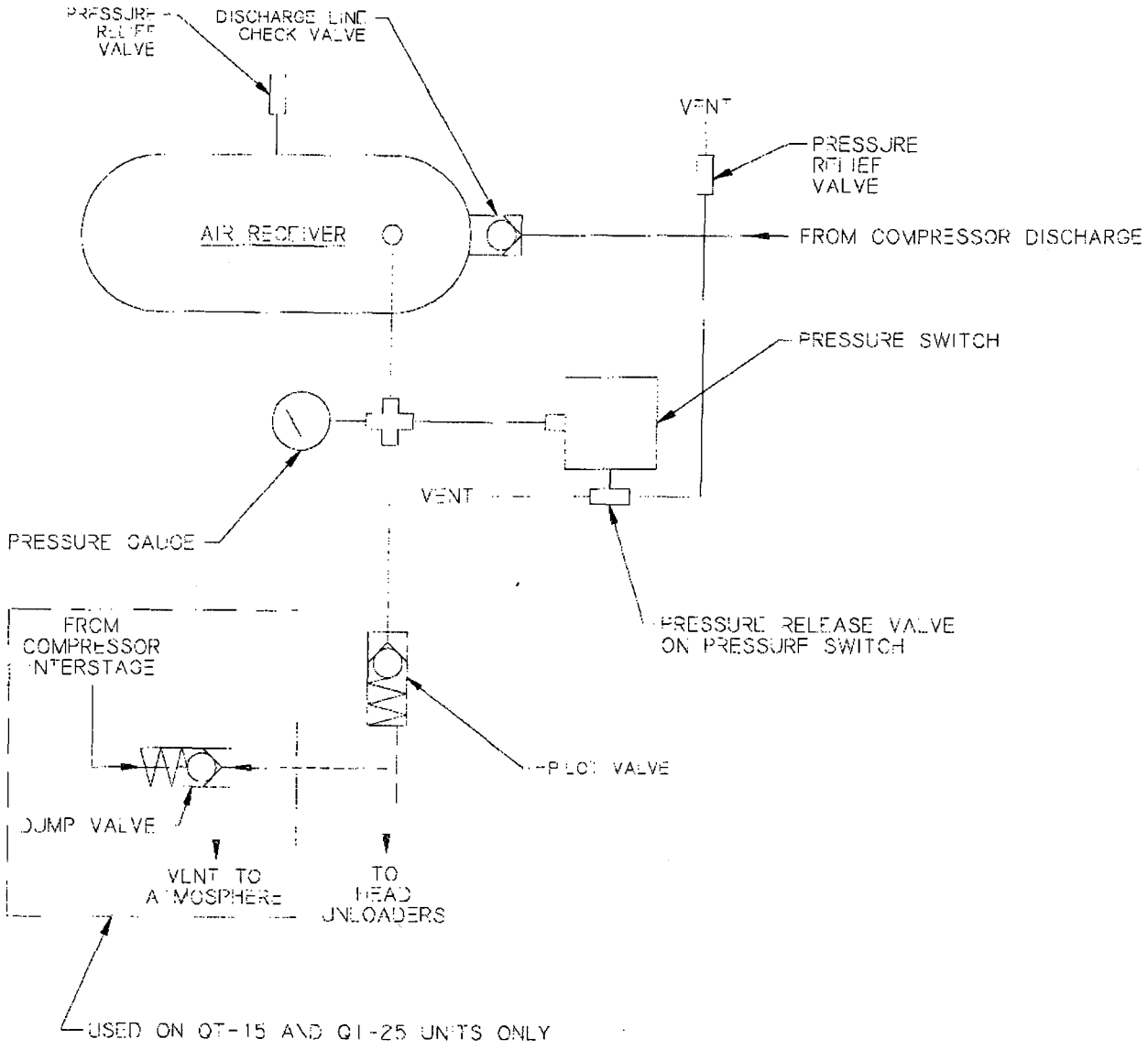


Fig. 3-6
Dual Control with Pilot Valve Unloading
Piping Schematic WP1781A

Note: Continuous Run Units - Prior to starting a continuous run unit, pull the ring attached to the pilot valve out and turn the finger nut in (clockwise) until it seats against the pilot housing. Now the compressor can be started unloaded. Once the compressor is running at full speed, the finger nut on the pilot valve can be turned out (counterclockwise) until it seats against the pull ring.

Step 4) Start compressor per factory instructions. (Refer to **SECTION 4, *Pre-Starting Checklist and Initial Starting & Operating.***)

Step 5) Check system pressure.

Step 6) Check cooling fan.

Step 7) Check all pressure relief valves for proper operation.

Step 8) Check control system for proper operation.

Mounting

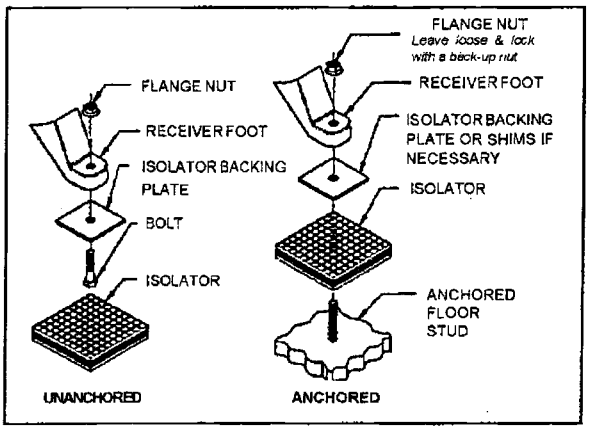


Fig. 3-7 Isolator Installation for Unanchored or Anchored Receiver

Proper mounting of QT & PLT series compressor units is crucial to the safe operation and longevity of the equipment. The installation requires a flat and level concrete floor or pad *(for mobile units see* **Mounting Mobile Units***)*. Satisfactory results can usually be obtained by mounting the compressor unit on vibration isolating pads available from your local Quincy Distributor. ***All vertical tank units must be anchored!*** Refer to **Fig. 3-7, Isolator Installation for Unanchored or Anchored Receiver.**

State or local codes may mandate that the compressor be bolted to the floor. In this case the unit must be leveled and bolted making absolutely certain the feet are not stressed in any manner. ***Leave the flange nut loose & lock it with a back-up nut!*** Uneven feet drawn tightly to the concrete pad will cause severe vibrations resulting in cracked welds or fatigue failure. The customer is responsible for providing a suitable foundation & isolator mounting where necessary.

Mounting Mobile Units

Gas engine driven compressors mounted to truck beds should be fastened in such a way so as not to create any stress to the air receiver tank. Truck beds, characteristically, have a tendency to flex and could cause damage to the receiver tank if the tank is fastened directly to the truck bed. It is the User's responsibility to provide an adequate means of fastening the unit in these applications.

System components

Efficiency and safety are the primary concerns when selecting components for compressed air systems. Products of inferior quality can not only hinder performance of the unit, but could cause system failures that result in bodily harm or even death. Select only top quality components for your system. Call your local Quincy distributor for quality parts and professional advice.

Drive Pulleys / Sheaves

Various pulley and sheave combinations are available to obtain the desired air pressure and delivery rate of your compressor. Consideration must be given to these combinations to ensure that the motor is not overloaded by operating above or below the designed speed range.

Whatever combination is employed, the drive pulleys & compressor sheaves must be properly aligned and drive belt tension set to specifications (refer to **SECTION 5, *Pulley / Sheave Alignment & Belt Tension***). Improper pulley/sheave alignment and belt tension can cause motor overloading, excessive vibration, and premature belt and/or bearing failure.

WARNING !

Excessive compressor RPM's (speed) could cause a pulley or sheave to shatter. In an instant, the pulley or sheave could separate into fragments capable of penetrating the belt guard and causing bodily harm or death. Do not operate the compressor above the recommended RPM (refer to SECTION 2, *Specifications*).

Step 12) After all the above conditions have been satisfied, the unit can be connected to the proper power source.

Step 13) Jog the starter switch to check the rotational direction of the compressor. It should agree with the rotation arrow embossed on the compressor sheave.

Step 14) Check for proper rotation of the cylinder cooling fan (fins inside sheave). The fan should blow cooling air across the cylinder.

Initial Starting & Operating

This instruction manual, as well as any instructions supplied by manufacturers of supporting equipment, should be read and understood prior to starting the compressor. If there are any questions regarding any part of the instructions, please call your local Quincy Distributor, or the Quincy Compressor factory.

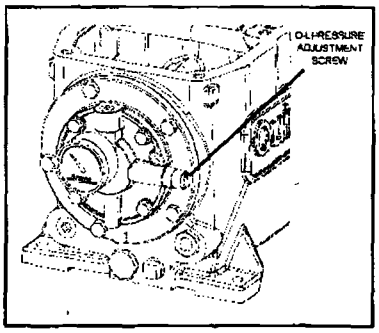


Fig. 4-1
Oil Pressure Adjustment

With the pre-starting checklist completed and satisfied, start the compressor. Watch and listen for excessive vibration and strange noises. If either exist, stop the compressor. Refer to **SECTION 6, *Troubleshooting*** for help in determining the cause of such problems.

If you are starting a pressure lubricated model, check the oil pressure. Compressors producing up to 175 PSIG of discharge air pressure should maintain 18 to 20 PSIG of oil pressure.

Normally the oil pressure does not need to be adjusted. But if it does, loosen the locknut on the adjustment screw located on the right side of the oil pump housing (see **Fig. 4-1, Oil Pressure Adjustment**). Increase the oil pressure by turning the adjustment screw clockwise; decrease the oil pressure by turning the adjusting screw counterclockwise. After adjustment tighten the locknut.

Check the air receiver pressure gauge or system pressure gauge for proper readings. If inadequate or excessive air pressure conditions exist, refer to **Section 6 Troubleshooting**.

Observe compressor operation closely for the first hour of operation and then frequently for the next seven hours. After the first eight hours, monitor the compressor at least once every eight hours. If any abnormal conditions are witnessed, stop the compressor and correct the problem. After two days of operation check belt tension, oil level, and inspect the system for leaks.

Daily Starting Checklist

Do not proceed until the ***Pre-starting Checklist*** and ***Initial Starting & Operating*** sub-sections have been read and are thoroughly understood.

Step 1) Check oil level in crankcase.

Step 2) Drain liquid from the air receiver and moisture trap (if so equipped).

Step 3) Jog the starter button and check compressor rotation.

Guards

All mechanical action or motion is hazardous in varying degrees and needs to be guarded. Guards should be designed to achieve the required degree of protection and still allow full air flow from the compressor sheave across the unit. Guards shall be in compliance with OSHA safety and health standards 29 CFR 1910.219 in OSHA manual 2206 and any state or local codes.

WARNING !

Guards must be fastened in place before starting the compressor and never removed before cutting off and locking out the main power supply.

Check Valves

Check valves are designed to prevent back-flow of air pressure in the compressed air system (air flows freely in one direction only). The check valve must be properly sized for air flow and temperature. **Do not rely upon a check valve to isolate a compressor from a pressurized tank or compressed air delivery system during maintenance procedures!**

Manual Shutoff Valves

Manual shutoff valves block the flow of air pressure in either direction. This type of valve can be used to isolate a compressor from a pressurized system, provided the system is equipped with a pressure relief valve capable of being manually released. The pressure relief valve should be installed between the manual shutoff valve and the compressor (refer to **Fig. 3-8, Typical Drop Leg & Component Location**).

Pressure Relief Valves

Pressure relief valves aid in preventing system failures by relieving system pressure when compressed air reaches a determined level. They are available in various pressure settings to accommodate a range of applications. Pressure relief valves are preset by the manufacturer and under no circumstances should the setting be changed by anyone other than the manufacturer.

DANGER !

Pressure relief valves are designed to protect compressed air systems in accordance with ASME B19 safety standards. Failure to provide properly sized pressure relief valves may cause property damage, severe personal injury or even death.

Pressure Switch

The pressure switch detects the demand for compressed air and allows the motor to start. When the demand is satisfied, the unit stops. Pressure switches provided by Quincy Compressor are pre-set at the factory and usually do not require adjustment.

Induction System

Air Intake

A clean, cool and dry air supply is essential to the satisfactory operation of your Quincy QT or PLT Series air compressor. The standard air filter that the compressor is equipped with when leaving the factory is of sufficient size and

SECTION 4 START-UP & OPERATION

Pre-starting Checklist

WARNING ! **Never assume a compressor is safe to work on just because it is not operating. It could restart at any time. Follow all safety precautions outlined in SECTION 5, *Stopping For Maintenance.***

WARNING ! **Failure to perform the pre-starting checklist may result in mechanical failure, property damage, serious injury or even death.**

Steps 1 through 12 should be performed prior to connecting the unit to a power source. If any condition of the checklist is not satisfied, make the necessary adjustments or corrections before starting the compressor.

Step 1) Remove all installation tools from the compressor and check for installation debris.

Step 2) Unless otherwise specified, Quincy QT & PLT Series compressors are normally shipped with break-in lubricant in the crankcase. **Check the lubricant level in the crankcase.** (Refer to **SECTION 5, *Lubrication*** for quantity and types of lubricant to be used.)

Step 3) Check motor pulley and compressor sheaves for alignment and tightness on shaft. (Refer to **SECTION 5, *Pulley / Sheave Alignment & Belt Tension.***)

Step 4) Manually rotate the compressor sheave several rotations to be sure there are no mechanical interferences.

Step 5) Check inlet piping installation (Refer to **SECTION 3, *Induction System.***)

Step 6) Check belt tension. (Refer to **SECTION 5, *Pulley / Sheave Alignment & Belt Tension.***)

Step 7) Check all pressure connections for tightness.

Step 8) Make sure all pressure relief valves are correctly installed. (Refer to **SECTION 3, *System Components.***)

Step 9) Be sure all guards are in place and securely mounted. (Refer to **SECTION 3, *System Components.***)

Step 10) Check fuses, circuit breakers, and thermal overloads for proper size. Verify that the supply voltage matches the motor requirements. (Refer to **SECTION 3, *Electrical Supply Requirements.***)

Step 11) Open all manual shutoff valves at and beyond the compressor discharge.

design to meet normal conditions, when properly serviced, in accordance with the maintenance section of this manual.

If, however, the compressor is to be installed in a location where considerable dust, dirt and other contaminants are prevalent, consult your local Quincy Distributor for advice and optional filters. It is the user's responsibility to provide adequate filtration for those conditions. Oil bath filters are not to be used. Warranty will be void if a failure is determined to be caused by inadequate filtration.

Remote Inlet Filters

Depending on the size of the compressor and the size and construction of the room in which the unit operates, the air inlet may have to be located outside of the room. If it is necessary to remotely install the air filter, make the inlet piping as short and direct as possible. Remotely installed air filters can lead to vibrations in the inlet piping. These vibrations can be minimized by adding a pulsation dampener in the inlet piping between the remote inlet filter(s) and the compressor.

If the inlet is routed to outside atmosphere, the inlet piping should be equipped with a hooded air filter and designed to prevent condensate, water or snow from being injested into the compressor.

All inlet piping should be at least the same size (or larger) in diameter as the inlet connection to the compressor. For every 10 feet of inlet piping or every 90° bend, increase the inlet piping diameter by one pipe size. The inlet piping must be thoroughly clean inside. Remove all weld slag, rust or dirt. Galvanized pipe with threaded or flanged fittings is preferred.

CAUTION !

Never locate the compressor air inlet system where toxic, volatile or corrosive vapors, air temperatures exceeding 100°F, water, or extremely dirty air could be ingested. These types of atmospheres could adversely affect the performance of the compressor system.

Compressed Air Discharge System

The discharge piping should be of the same diameter as the compressor discharge connection, or sized so that the pressure drop at any point in the system does not exceed 10% of the air receiver pressure. Install auxiliary air receivers near heavy loads or at the far end of a long system. This will insure sufficient pressure if the use is intermittent, or sudden large demands are placed on the system.

Discharge piping should slope to a drop leg (refer to **Fig. 3-8, Typical Drop Leg & Component Location**) or moisture trap to provide a collection point where moisture can be easily removed. All service line outlets should be installed above the moisture traps to prevent moisture from entering the tool or device using the air. Manual shutoff valves, protected by pressure relief valves, should be installed at all service line outlets to eliminate leakage while the tools are not in use.

As with any piping, all parts of the discharge piping should fit so as not to create any stress between the piping and components.

Manually Draining An Air Tank:

Step 1) Disconnect & lockout the compressor from the power source (electric models) or disconnect the spark plug wire from the spark plug (gas engine models).

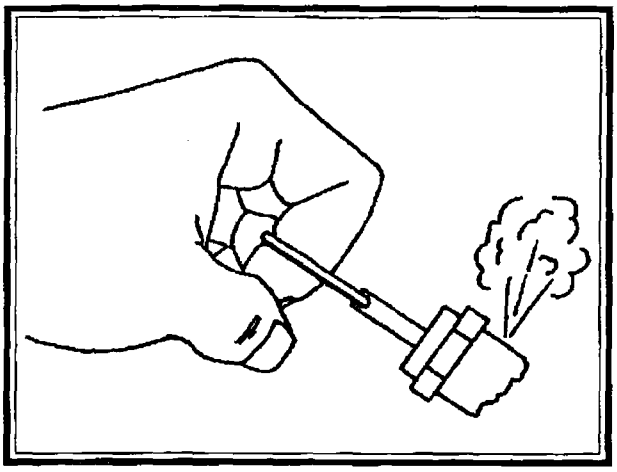


Fig. 3-10 Checking Pressure Relief Valves & Relieving System Pressure Pix1160

Step 2) Tanks subjected to freezing temperatures may contain ice. Store the compressor in a heated area before attempting to drain moisture from the tanks. Reduce the air pressure in the tank to 30 PSIG by pulling the pressure relief valve ring (refer to **Fig. 3-10, Checking Pressure Relief Valves & Relieving System Pressure**).

Step 3) Open the drain valve and allow the moisture and air mixture to drain from the tank.

Step 4) Once the moisture has been completely drained, close the drain valve.

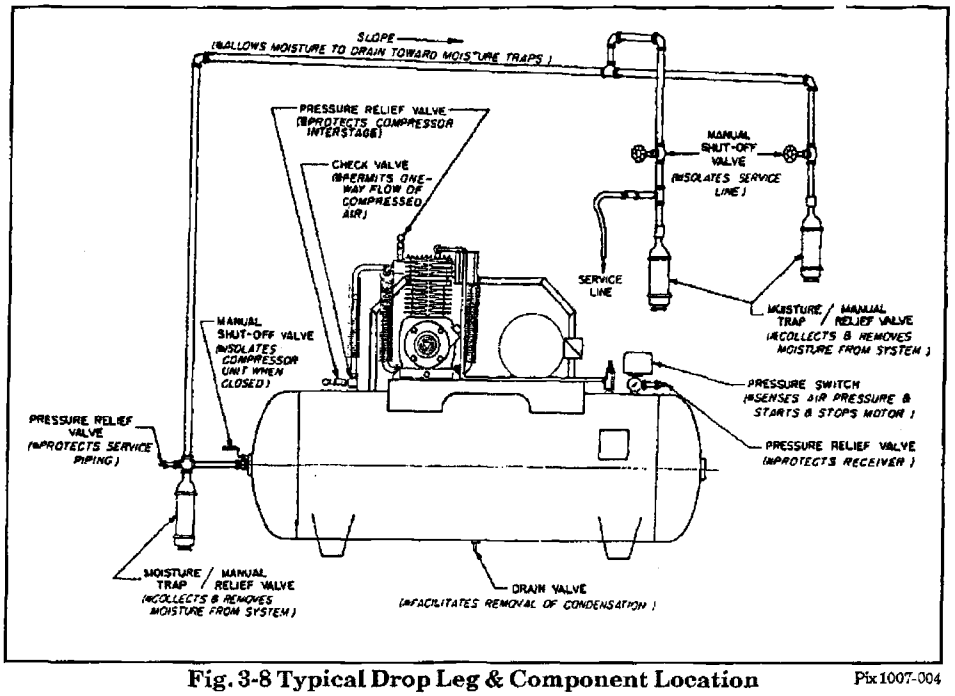


Fig. 3-8 Typical Drop Leg & Component Location Pix1007-004

Pnuematic Circuit Breakers or Velocity Fuses

The Occupational Safety and Health Act (OSHA), Section 1926.303, Paragraph 7, published in the Code of Federal Regulations 29 CFR 1920.1, revised July 1, 1982 states that all hoses exceeding 1/2" inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of a hose failure"

These pnuematic safety devices are designed to prevent hoses from whipping and/or the loss of hazardous or toxic gasses, all of which could result in a serious or fatal accident.

WARNING !

Never join pipes or fittings with lead-tin soldering. Welded or threaded steel pipes and cast iron fittings, designed for the pressures and temperatures, are recommended.

Pressure Vessels

Air receiver tanks and other pressure containing vessels such as *(but not limited to)* pulsation bottles, heat exchangers, moisture separators and traps, must be in accordance with ASME Boiler and Pressure Vessel Code Section VIII and ANSI B19.3 safety standards. They must be equipped with a properly sized pressure relief valve, pressure gauge, tank drain, & manual shutoff valve (refer to **Fig. 3-8, Typical Drop Leg & Component Location**).

WARNING !

Follow ASME code for air reciever tanks and other pressure containing vessels. Pressure vessels must not be modified, welded, repaired, reworked or subjected to operating conditions outside the nameplate ratings. Such actions will negate code status, affect insurance status and may cause property damage, severe injury or even death.

A drain valve should be located in the bottom of the air receiver to allow for moisture drainage. An automatic drain valve is recommended. Extend piping away from the unit and any personnel in the immediate area to provide safe and convenient removal of excess moisture.

If the air receiver is going to be subject to temperatures of 32°F or below, provisions must be made to guard against freezing of the pressure relief valves, check valves, pressure gauge, and moisture drain.

Condensation

Rust can form inside the crankcase and on internal components as a result of condensation. It is recommended that you run your compressor long enough to allow it to warm up, thereby reducing the chance for condensation to form in the crankcase.

Condensation can also form in the air tank of your compressor. When this happens, a mixture of air and moisture will be expelled through the service valve and into whatever is connected to the valve (e.g. air hoses, metal air lines, pneumatic tools, spray guns). An in-line filter or dryer, available from your local Quincy distributor, may be required to eliminate the moisture.

Condensation in the air tank can be kept to a minimum by draining the tank on a daily basis. This also reduces the risk of rust developing and weakening the tank.

Manual Tank Drain Valve Operation

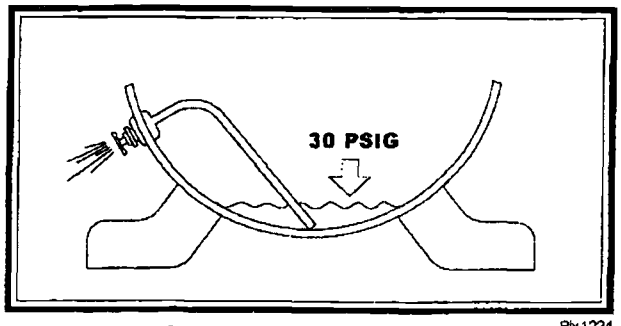


Fig. 3-9 Internal Drain Tube Plx1224

The manual tank drain valve on portable compressors and some stationary compressors is located on the underside of the air tank. Portable compressors can be tilted in the direction of the drain to allow removal of tank moisture.

Some tanks use an internal drain tube (Refer to **Fig. 3-9, Internal Drain Tube**) to drain the moisture. Tank pressure is required to force moisture out of the tank through the drain tube. Safe removal of tank moisture from the air tank is dependent upon an internal tank pressure of no more than 30 PSIG. Higher internal tank pressures are dangerous and could cause serious injury!

WARNING ! **Do not open a manual tank drain valve on any air tank containing more than 30 PSIG of air pressure!**

WARNING ! **Never attempt to relieve an air tank by removing a pipe plug or any other system component!**

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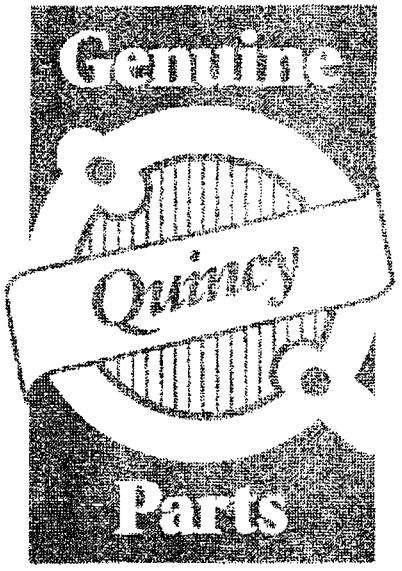

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